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Volume 2

Selected Papers on the Practice of Educational Communications and Technology Presented at the 2007 Annual Convention of the Association for Educational Communications and Technology

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Anaheim, CA

Editor: Michael Simonson

Nova Southeastern University, North Miami Beach, Florida

2007 Annual Proceedings - Anaheim: Volume #2

Selected Papers
On the Practice of Educational Communications and Technology
Presented at
The Annual Convention of the Association for Educational Communications and Technology
Sponsored by the Research and Theory Division
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2007

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Preface

For the thirtieth year, the Research and Theory Division of the Association for Educational Communications and Technology (AECT) is sponsoring the publication of these Proceedings. This is *Volume #2 of the 30th Annual Proceedings of Selected Papers On the Practice of Educational Communications and Technology.* This volume includes papers presented at the national convention of the Association for Educational Communications and Technology held in Anaheim, CA. Copies were are available online at AECT.ORG. Volumes 1 and 2 are also available through the Educational Resources Clearinghouse (ERIC) system.

This volume contains papers primarily dealing with instruction and training issues. Papers dealing with research and development are contained in the companion volume (Volume #1).

REFEREEING PROCESS: Papers selected for presentation at the AECT Convention and included in these Proceedings were subjected to a reviewing process. All references to authorship were removed from proposals before they were submitted to referees for review. Approximately sixty percent of the manuscripts submitted for consideration were selected for presentation at the convention and for publication in these Proceedings. The papers contained in this document represent some of the most current thinking in educational communications and technology.

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The Need

A February 2004 memo from the Undersecretary of Defense, which includes an explicit requirement to use a "robust systems engineering approach" (¶ 1) on all projects and contracts associated with the military. The Boeing Company's long-term strategy is tied very closely to a continuance and maintenance of Department of Defense (DoD) projects as well as commercial customers. Regardless of whether the customer is the DoD or a commercial venture, each of Boeing's customers expects a product delivered on time, within costs, and performing to the desired outcome. If any one of these expectations is not met, the result is customer dissatisfaction. Systems Engineering (SE) influences cost, schedule, and performance, so a solid SE approach on each program increases the likelihood of meeting customer expectations, which is directly tied to Boeing's long term strategy of customer continuance and maintenance. Additionally, SE directly impacts Boeing's bottom line profitability.

The Boeing Company defines Systems Engineering as an interdisciplinary collaborative approach to derive, evolve, and verify a life cycle balanced solution that satisfies customer expectations and meets public acceptance. This definition places Systems Engineering more in the category of a business process that touches many stakeholders, than an engineering discipline. While Systems Engineering had been a practice within Boeing for many years, it had not achieved a level of implementation relative to the role it plays within the organization. To achieve an objective of becoming a recognized industry leader in Systems Engineering applications, The Boeing Company determined that Systems Engineering practices needed to receive greater attention and focus within the organization.

The Solution

A crucial challenge to achieving the objective was to modify the efficiency and order mindset of the engineer learner audience from a narrow engineering focus, to an orientation of adaptability and openness within a larger system with a wide variety of stakeholders (Svaboda & Wahlen, 2004/2005). To meet this challenge, Boeing partnered with Vangent Inc. to develop a blended *Systems Engineering Leadership Program* (SELP) with the primary affective objective of having the learners recognize the value Systems Engineering brings to a project or program. As shown in Figure 1, the SELP incorporates both synchronous and asynchronous online components, instructor-led components, classroom computer-based simulations, and program effectiveness evaluation strategies. The program is delivered in five segments:

1. Segment 1: Pre-course Discussion (2 hours)
2. Segment 2: Introductory Web-based training (WBT) (1.5 hours) and Simulation pre-read (1.5 hours)
3. Segment 3: Classroom Sessions (4 days blend of Instructor-led training (ILT) and Web-based (or CD-ROM-based) simulation
4. Segment 4: Follow-up (1.25 hours WBT)
5. Segment 5: Post-course Discussion (4 hours in-person or virtual discussion group)

Six months after completing the curriculum, learners complete a Post Course Impact Assessment which consists of a behavioral survey instrument designed to measure the extent to which course participants have been able to transfer what they learned in the course to their actual job performance.

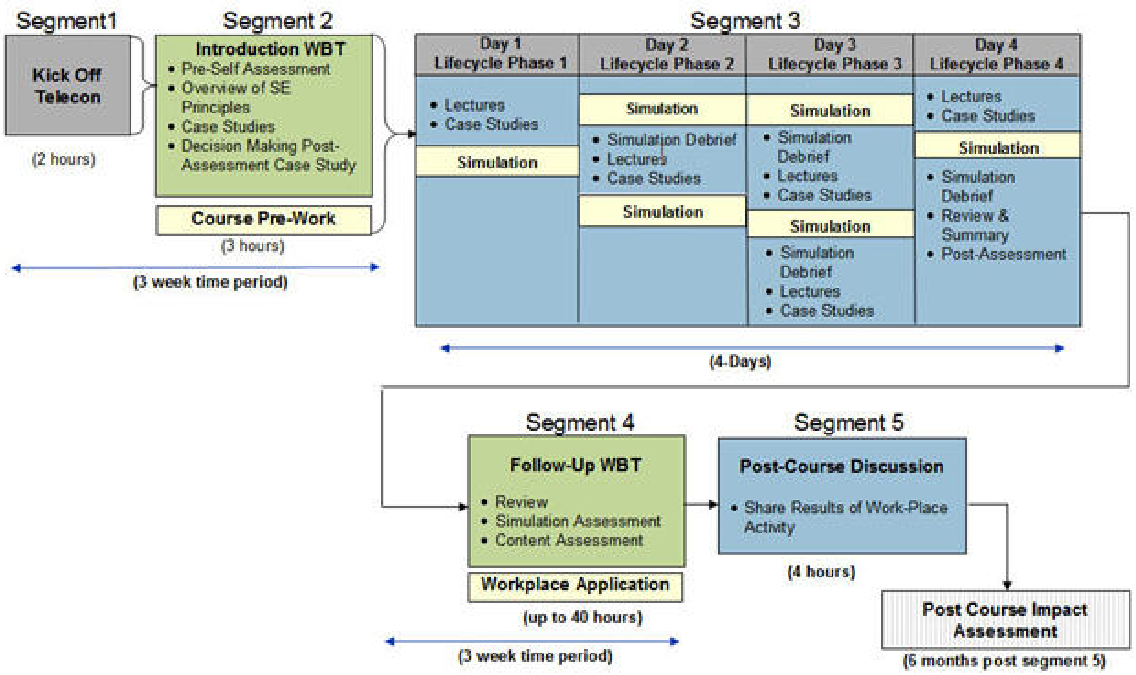

Figure 1. The Systems Engineering Leadership Program

Theoretical Framework

Bloom's taxonomy of cognition provides a useful framework for understanding the curriculum structure. The taxonomy can help make sense of this complexity by breaking down the objectives into six hieratical categories: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation (Bloom, 1994). These six categories are arranged on level of difficulty. In other words, a learner who is able to perform at the higher levels of the taxonomy is demonstrating a more complex level of cognitive thinking. The design approach arranges the SELP curriculum so that the learner:

1. Builds basic knowledge in the early portion of the Introduction WBT
2. Begins to comprehend how the various chunks of knowledge interrelate during the Introductory WBT case studies.
3. Continues to gain knowledge and comprehension, and starts to apply the knowledge to a simulation in segment three.
4. Has opportunities to analyze the benefits and consequences of his or her actions during simulation debriefs in segment three.
5. Is encouraged to synthesis the learning experience by conducting an on-the-job SE project between segments three and five.
6. Is provided opportunities to evaluate the impact of the learning experience with the post-course assessment (segment four), the post course discussion (segment five), and the post course behaviors impact assessment.

This diverse blend of activities and opportunities for reflection and self assessment, facilitate the higher-order critical thinking skills at the end of the taxonomy that are critical for SE success.

The center piece of this curriculum is a learning team-based Systems Engineering simulation of the entire product/program life-cycle, which is interspersed throughout a four-day classroom session. In a simulation, the learner takes responsibility for the decision-making, experiencing the positive and negative consequences of those decisions. This results in the learner gaining valuable problem solving and decision-making skills. The simulation reinforces key concepts taught in the classroom using scenario-based activities, which challenge participants to use Systems Engineering principles to solve real-life problems. This allows the learners to apply previously acquired knowledge and skills to control an environment that replicates the real world.

The theoretical framework behind this simulation approach was based on Kolb's (1984) four-stage framework of experiential learning; which includes concrete experience, reflective observation, abstract conceptualization, and active experimentation. Experiential learning occurs when individuals participate completely in the learning process, control its nature and direction, and the learning activities are primarily based upon direct confrontation with practical, real-world problems; and learner self-evaluation is the principal method of assessing progress or success.

Simulation Construct

The construct of the simulation is a blend of computer-based courseware, learning team discussion and activities, and large group presentations. Prior to attending the four day classroom session, the learners were provided with a pre-read proposal document outlining a conceptual product development program that would be the subject of the simulation. The simulation itself consisted of four interactive CD-ROM modules; one for each product life cycle phase, and a set of PowerPoint templates on which learning teams document assigned activities in preparation for debriefing presentations at the end of each phase. The computer-based portions of each simulation phase provided virtual interactions with key stakeholders of a simulated development program; using emails, voicemails, simulated phone calls and phone conferences, and simulated Internet research resources.

The simulated emails consist of text and narration describing the current contextual setting, and an email "Inbox" which can contain up to 10 messages. Learners are directed to click on the email message in the *Inbox* (Figure 2) to open the message window and read the message. The email messages can contain text, and optional attached files or links to simulated Internet resources. Figure 3 provides an example of an email containing a link to a simulated Internet resource. In this example the link take the learners to a fictitious company's web site which is contained on the simulation CD.

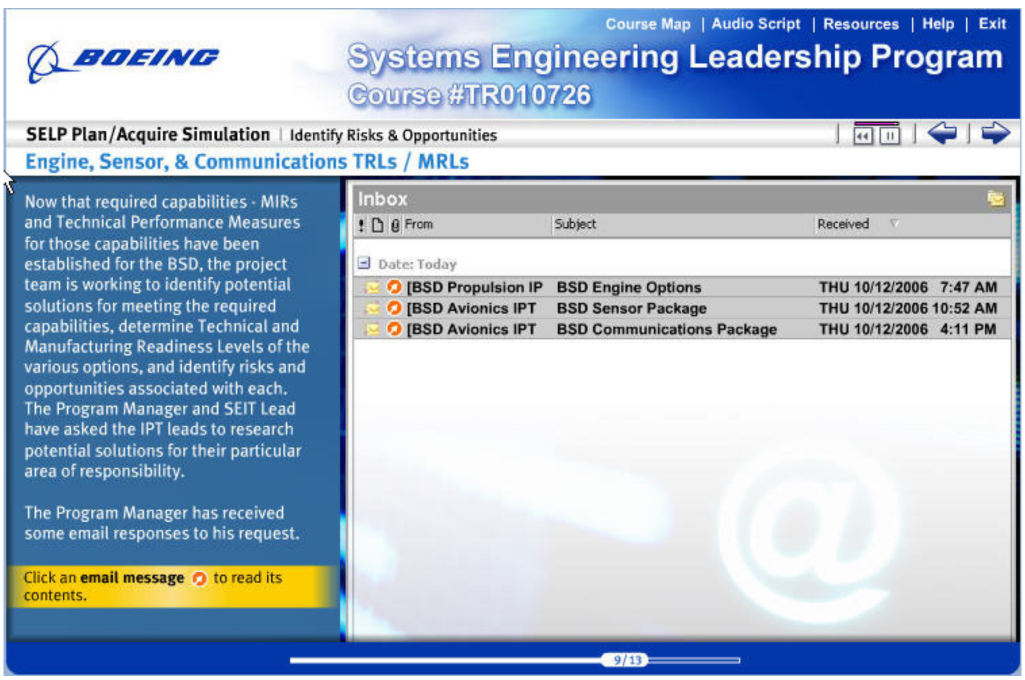

Figure 2. Simulated Email Inbox

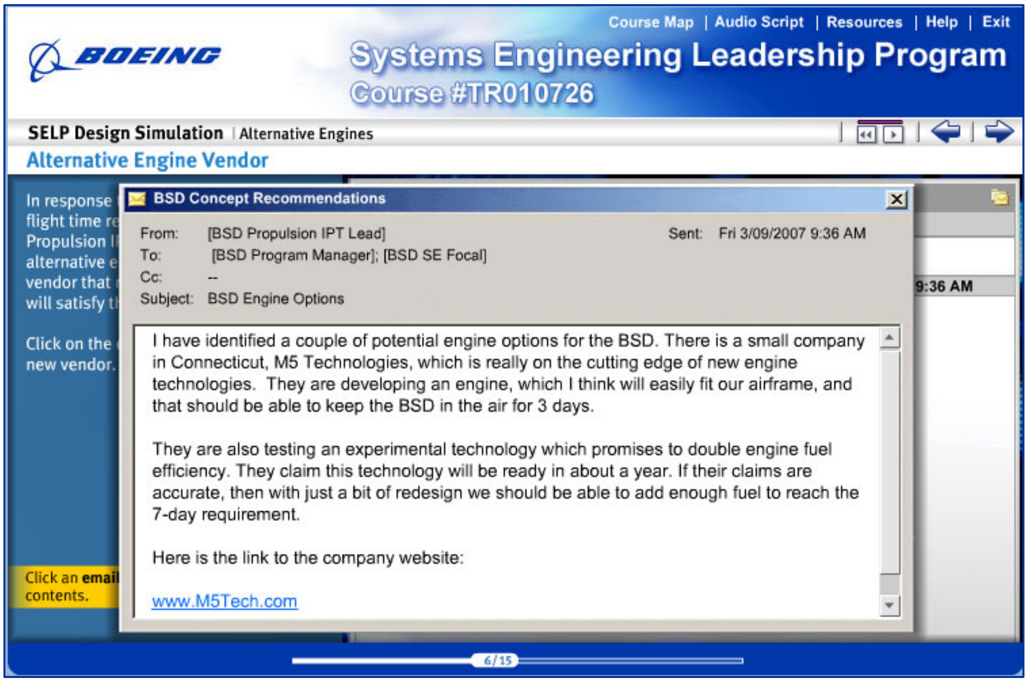

Figure 3. Email Containing a Simulated Internet Resource

At certain points of the simulation, it is necessary for learners to contact key individuals or organizations, in order to obtain additional information or receive clarification or insights into information they have already received. In the example shown in Figure 4, the learners are directed to contact fictitious company. The phone number for this fictitious company can be found provided on a web site provided by a link in a previous email. When the learners dial the correct number, they are presented with an audio phone conversation providing more information relevant to the simulation.

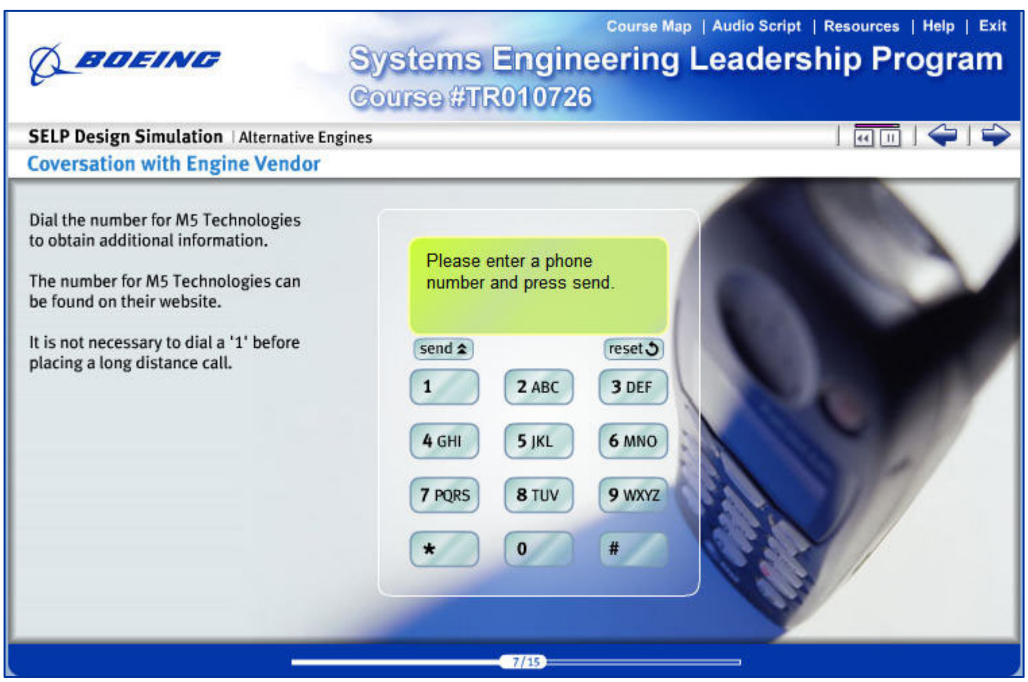

Figure 4. Making Phone Calls

Another strategy used to simulate the real world environment is voice mails. Voice mails consist of text and narration describing the current contextual setting. The text typically describes which member the project team have an awaiting voice mail and directs the learner's to click the star (*) icon on the keypad to retrieve the message (see Figure 5). When the learner clicks on the star (*) icon, the audio message was played.

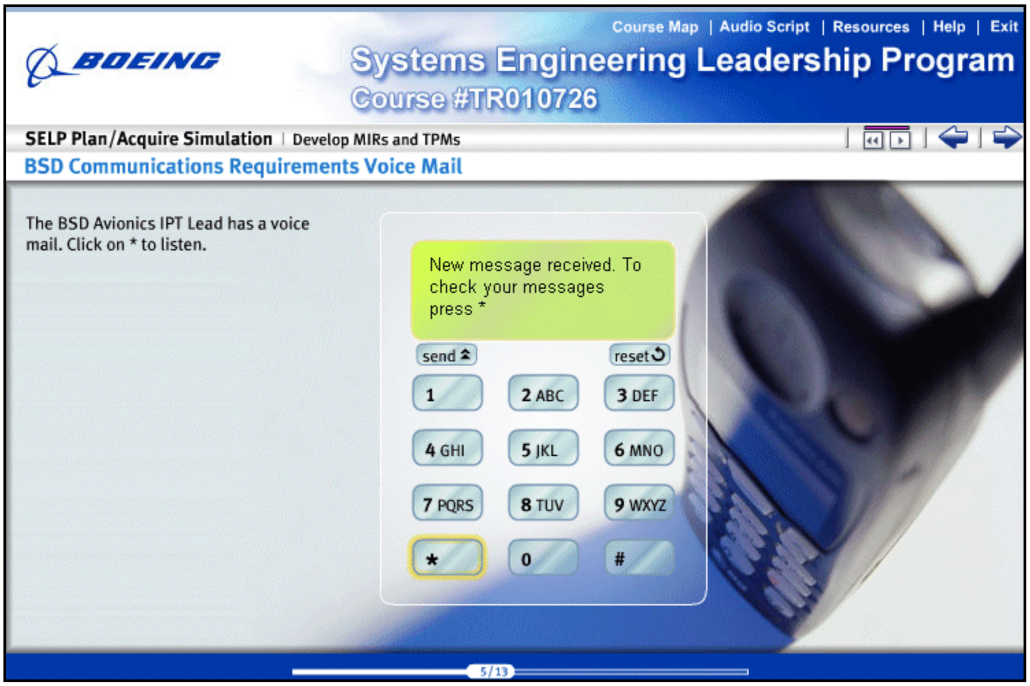

Figure 5. Voice Mail

Phone conferences are used to present a dialogue between two people, or a group of people. The initial text introduces the context of the dialogue. The dialogue is then presented using both audio and text (see Figure 6).

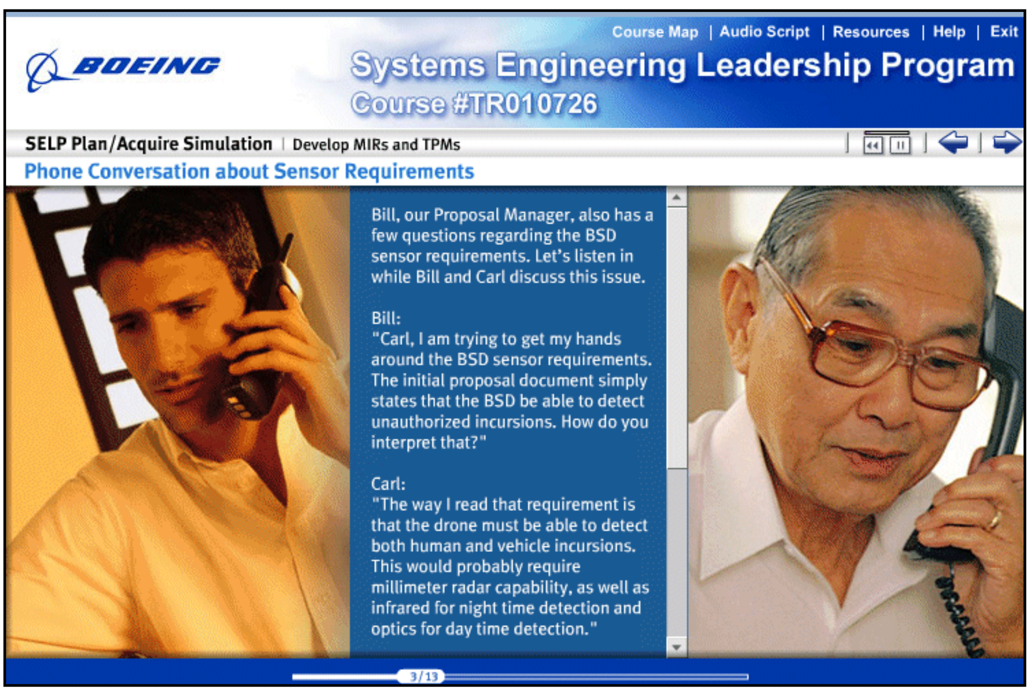

Figure 6. Phone Conference

Based on the information provided by the virtual interactions, teams perform specific analysis tasks and document the analysis on the PowerPoint templates provided on the simulation CD. Learners are directed to open a PowerPoint template on their team computer, then complete and document an activity or series of activities. In the example shown in Figure 7, the learner's are directed to conduct a simplified trade study for thee engine options they have researched in the simulation.

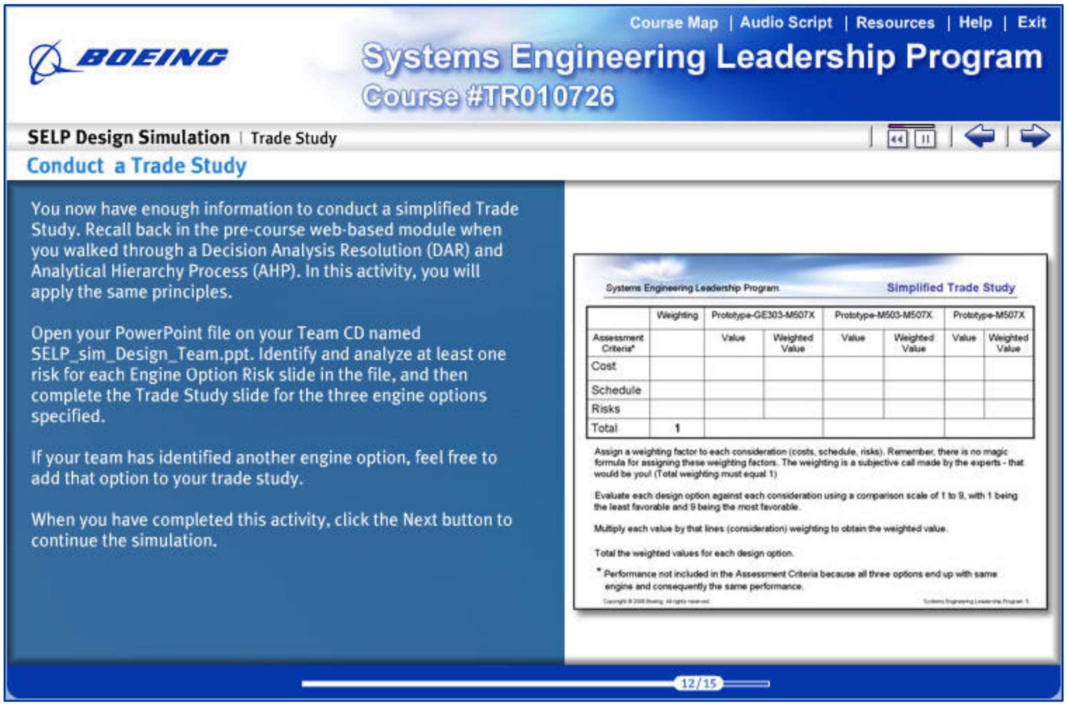

Figure 7. Team Task

After completing the activities, teams re-engage with the computer-based simulation and are presented with decision points. Each decision point allows the teams to select from multiple paths as shown in Figure 8. A significant feature of the decision points is that each potential decision has benefits and consequences, as shown in Figure 9, and each potential decision could be considered correct. Because of the number of variables and complexities involved with real world systems engineering problems, it is not practical to have the learners calculate actual numbers such as costs and schedule. To solve this limitation, potential benefits and consequences of the decision were presented on parametric graphs as seen on Figure 9. Regardless, the importance of each decision is not necessarily the potential benefits and consequences, but instead the process used to arrive at the decision.

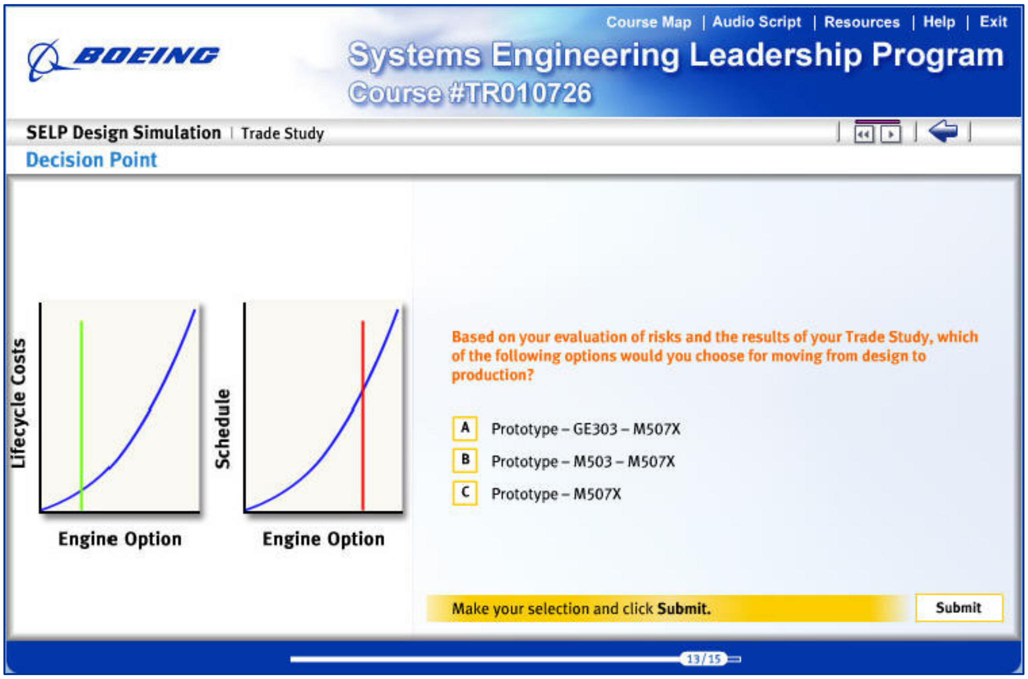

Figure 8. Decision Point

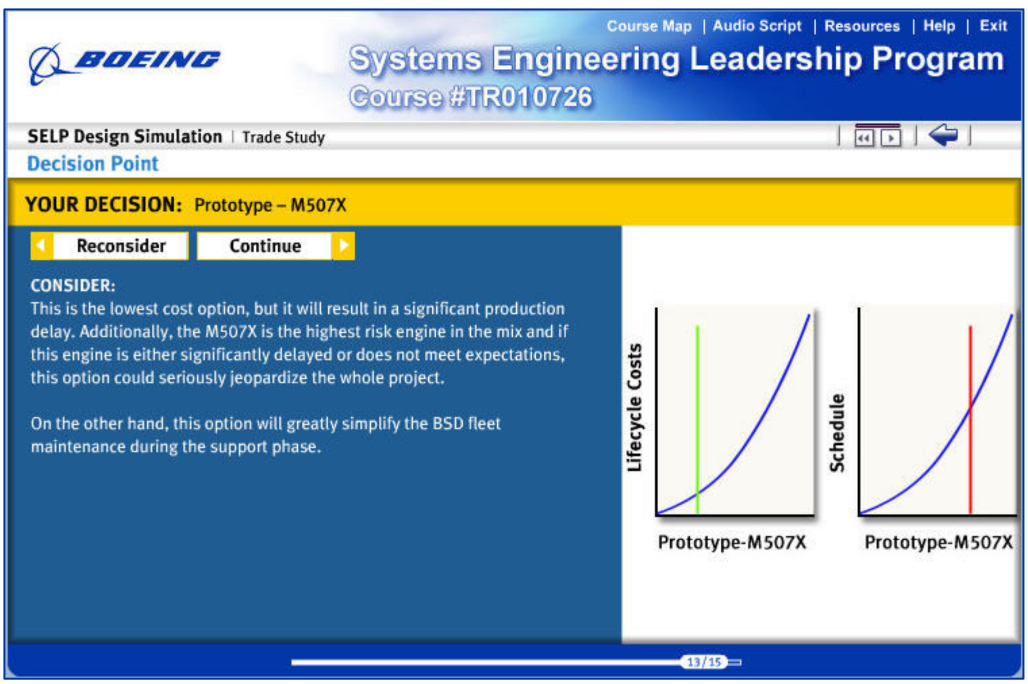

Figure 9. Benefits and Consequences of Decisions

To help the learners validate their decision-making processes, teams debrief the entire class at the end of each simulation phase. Debriefing moves the learners from passive recipients of information to active participants in a shared experience (concrete experience). Debriefing also causes the learners to reflect upon and discuss the shared experience (reflective observation), consider how their experience and those of other learners relate to previously taught information (abstract conceptualization), and formulate methods for using the newly acquired knowledge in the workplace (active experimentation) (Walker, 2005).

Conclusion

It is important to remember that the simulation is not the solution, but instead just a part of the solution. In order to meet the program goals, it was understood that the SELP program would need to facilitate learning along the entire hierarchy of Bloom’s taxonomy. The simulation, based on Kolb’s experiential learning circle, provides the learners with an opportunity to apply new knowledge and analyze the benefits and consequences of his or her actions.

One of the first participants to complete the SELP has found a practical application for his training. A new contract requirement dictates that risk management costs be identified separately rather than being combined with other costs. The participant was able to apply the training he received in SELP to meet this need. He stated: "By applying a good risk management tool and the risk management techniques taught in the class, we now have the capability to provide the information to support the revised contracting process ... We took a process from Engineering and reapplied it to satisfy a contract requirement."

In effect, the simulation provides a bridge (as shown in Figure 10) through the center of the Bloom’s hierarchy which prepares the learners for synthesizing the learning experience when conducting their on-the-job Systems Engineering project between segments three and five, and evaluating the impact of the learning experience during the post-course discussion and assessment.

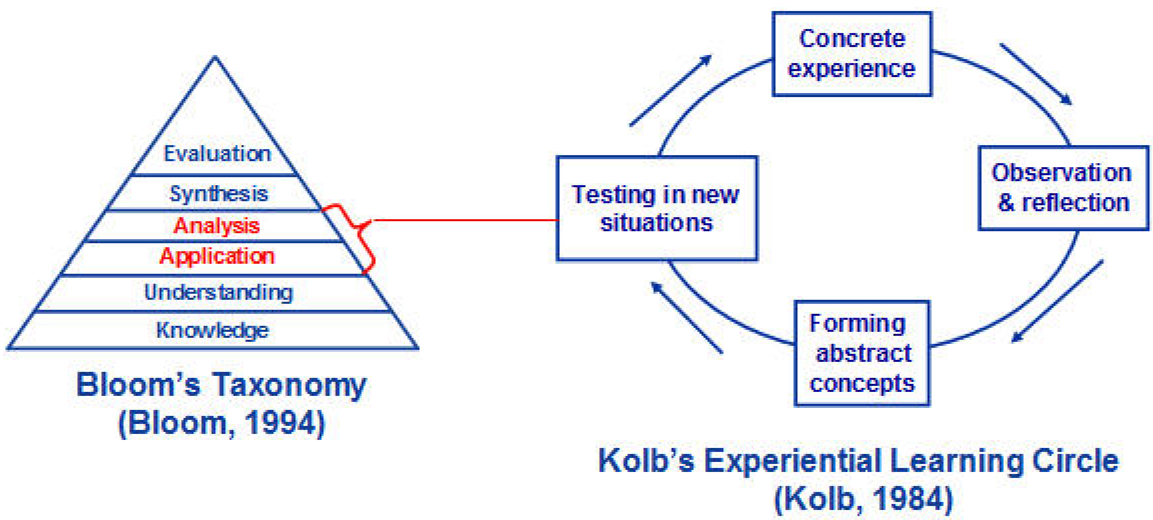

Figure 10, Tying the Theories Together to Bridge the Gap

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The Promises of Videoblogging in Education

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Introduction

Recent technological advances have redefined the traditional concepts in many fields and restructured the interactions in our social environments. The ways we communicate, learn and socialize are now different than once they used to be. The criteria for being "competent" or "successful" in our society are now measured with the extent we adopt new technologies into our lives, use them effectively and create solutions to the current problems. For the purpose of preparing competent and adaptable individuals to the complex and information rich society, educators need to reconsider their current educational practices by integrating emerging technologies into their classroom settings.

High broadband connections and user-friendly development tools generated a new genre of internet users who actively contribute to the development of media by editing and uploading videos to the internet and sharing them with their audiences within a community. Videblogging has emerged as a way of communication through audio-visuals in blogging activities and gained extensive popularity among today's Internet users by providing new ways of communication and representation of ideas through interactive channels. Although its popularity amongst Internet users has increased in the last couple of years, not a lot of educators focused on the use of videoblogging technology in education. As a highly developing trend on the Internet, videoblogging may offer teachers and students rich communicational channels for learning and communication of ideas through producing and sharing media.

This paper aims at exploring the educational uses of videoblogging activities in teaching and learning settings. The intent is to introduce this highly interactive technology to educators by mainly investigating its possible uses for educational purposes.

Blogging technology

Weblog, "an internet based personal publishing system" (Miles, 2005, p. 1), has gained tremendous popularity among the Internet users in the last couple of years. Weblogs are frequently modified webpages where data entries are listed in reverse chronological order (Herring et al., 2004, p. 1).

Armstrong et al. (2004) listed some of the characteristics of webblogging as follows:

- Ease of use, where the author can publish to the web without using any programming code.
- No need for installing any server software on the users' machine.
- The user has extensive control over how his or her blog looks and operates.
- Whenever the user edits his or her blog the results are instantly updated and available to others.
- Like any other website, blogs can be simply linked to and navigated.

Today, the majority of bloggers use webblogging as a form of personal communication and expression. According to Nardi et al. (2004) people blog for several reasons. Bloggers who participated in the study indicate that blogs serve as:

- documentaries of their life through which they publish updated information about activities and events,
- commentaries as a way of which people express their personal opinions and make their voices heard,
- catharsis as a means of expressing feelings and emotions,

- muses by which people structure their thinking through writing, shaping their writing with their audience and creating an archive,
- community forums in which bloggers share their pieces with others and reflect on other posts as well.

"Combined with the unprecedendent opportunity, blogs provide for ordinary people to self-express publicly" (Herring et al., 2004, p. 11). As blogs continue to grow in popularity, their unique characteristics have also been explored by educators to meet the learning needs of digital native young generation. Below, some of the possible benefits of using webblogging in educational settings are summarized from the literature.

- *Blogs can be used as electronic journals where students document their learning* (Armstrong et al., 2006). Writing reflections on field practices, students can record and report what they learned.
- *Blogs can be used to foster collaborative work.* Bringing multiple users together to contribute and share their ideas in a platform, webblogs encourage students to have different perspectives through ongoing and interactive discussions and reflection on different ideas (Barlett-Bragg, 2003; Walker, 2005).
- *Blogs can serve as electronic publishing tools.* Publishing their works, reports and artifacts in their blogs, students can make their work public, receive immediate feedback from their peers, practice and develop their writing and readings skills (Barlett-Bragg, 2003; Ward, 2004).
- *Blogs can support individual reflection.* Webblogs provide students with opportunities to organize and map their learning progress (Xie & Sharma, 2004; Stiller & Philleo, 2003; Sharma & Fiedler, 2004).
- *Blogs can assist language learning.* Communicative language learning can be enhanced with writings and readings in blogs (Ward, 2004).
- *Blogs can serve as student portfolios.* Online portfolios have been used to enable students to organize their works and present them in a meaningful manner. Since webblogs archive students' works automatically, they can help students see their processes through the postings at different times (Lohnes, 2004).

What is videoblogging?

Videoblogging is now a new and popular trend in blogging circle and differs from its parent, textual blogging, by offering audio-visual capabilities to communicate. EDUCAUSE Learning Initiative (2005) defines a videoblog as a "web log (blog) that uses video rather than text or audio as its primary media source" (p. 1). Borrowing from the definitions of Bryant (2006), this paper will use the term *videoblog* to refer to blogging activity; *vlog* to the posts and videos; and *videobloggers* to the people who produce and publish vlogs in their blogs.

Advances in broadband connections and video-hosting services, emergence of easy-to-use video editing software, affordable prices of video recording tools and accessible video technologies stimulated videblogging diffusion on the Internet. As Hoem (2004) affirms, "the importance of video, being a very powerful medium, the increased amount of video material on the web, and the possibilities offered by weblogs when it comes to collaboration sums up in 'videoblogs' as one of the most promising tools which may foster media literacy" (p. 3).

Vlogs combine images, audio, movies and text to communicate personal reflections, expression of feelings, documentaries and stories. Videobloggers generally edit their video with video editing tools, adding background music, sound or text and upload them to their videoblogs to share their vlogs with their audiences. Videobloggers share their videos within a community, receive comments on their videos and set a conversation with their audiences.

The videoblogging process is relatively simple for anyone who is familiar with video editing tools and blogging. A videoblogger first makes a short film, transfers the film from digital camera to computer, edits it with video editing software, becomes a member of a website which hosts video, uploads the video to the website, gives a title to the videoblog, shares it with the audience in the videoblog and gets feedback on vlog through comments. The quality of vlogs ranges from very basically edited vlogs to the professionally edited and esthetically created ones based on the technical skills of videobloggers and the intended message of vlog.

Reasons for videoblogging

People create vlogs for several reasons. "Videobloggers are artists, filmmakers, technology geeks and citizen journalists who go out and report news that major news networks may have overlooked or underreported" (Bryant, 2006, p. 12). The types of videblogs range from videoblogs on personal lifes to videoblogs about news, politics, environmental problems, magazines and entertainment. The power of video in delivering the message provides people from variety of backgrounds and interests to share what they feel and think in regard to a variety of subjects. Bryant (2006) lists some of the reasons for videoblogging: Keeping in touch with distant friends and relatives; ego-stroking; archiving family history and interviews; ranting about issues in their lives; learning more about digital video technology; increasing the online presence of a minority group; making people laugh (for comedy vloggers); making new friends online; to make money (videblogging as employment) and to promote business as a means of delivering products (pp. 16-17).

In his videoblog travelvlog.blogspot.com, Graham Walker shares his vlogs about his trips around the world. Steve Garfield as a pioneer and supporter of videoblogging, creates vlogs about anything at stevegarfield.blogs.com/videoblog/ and produces "'The Carol and Steve Show" which displays short episodes from his daily life with his wife Carol. "It's part of the democratization of media," says Mr. Garfield. "It gives people the tools to express themselves and be creative in all different ways" (Searcey, 2005).

Videoblogging may serve as a platform for ordinary citizens to be journalists and reflect on what they see as essential for others to know, listen and see. Josh Wolf posts in his videoblog "the revolution will be televised" at http://thisrevolution.blogspot.com/ at least once a week to tell the stories that they believe are ignored by conventional news producers. The aim of the videobloggers like Wolf is to democratize media by promoting citizen journalism, the idea of promoting ordinary people to "report and produce news and entertainment, using new technology that gives them powers once held solely by the Fourth Estate" (Hua, 2005). Another videoblogger Raymond Kristiansen states that "We don't need the mainstream media to tell us what's interesting anymore. Millions of people want to tell their stories, and with videoblogging, they can tell their stories" (Boyd, 2005).

The number of videobloggers has increased in the last couple of years due to the abovementioned reasons and they are inspired by their audiences who are watching their vlogs and making comments on them. Communities are formed among videobloggers who advocate videoblogging such as "meet the vloggers: a series of focused on videoblogging" at http://meetthevloggers.blogspot.com. Vloggercon at http://www.vloggercon.com is another event that videobloggers come together to share, interact and collaborate with other videobloggers.

Videoblogging is considered as the next generation of communication through posting, sharing, producing and publishing content on the Internet. Among videobloggers are some educators who have been trying to explore the educational benefits of videblogging. This new and diffusing technology is being experimented to enhance educational settings by promoting active participation of learners in their learning process. The next section aims at informing educators about the educational benefits and possible educational uses of this fast growing technology trend and phenomenon.

Videoblogging in education

Videoblogging is one of these latest technologies that opened new ways of communication through public-created media. Since videoblogging is such a new technology and a trend on the Internet today, only few videobloggers have recognized the promises of videoblogging for teaching settings and have used it in their teaching practices. The teachers and educational practitioners who are interested in this technology come together in a forum "Vlogging for K-12 Teachers" at http://groups.google.com/group/Vlogging-for-K-12-Teachers, discuss their practices, share their works and find out other possible educational uses. Two interviews were conducted with these practitioners who have been using videoblogging technology in their educational practices since the very early days of videoblogging technology. The insights, ideas and experiences gathered in the interviews are summarized in two sections: Teachers as videobloggers and students as videobloggers.

Teachers as videobloggers

In videoblogging community, there are some teachers and educators as videobloggers who want to communicate their educational messages with this highly engaging tool. Among them was Bre Pettis who now makes magazines doing videoblogging. He generates videoblogs about the processes of making things in a humorous way. He put his video on the Internet in September 2003 and started videoblogging in the Spring 2004. He was keeping a textual blogging before and was later attracted by the offerings of new videoblogging technology. Since then, he has been keeping a videoblog about the things he creates and teaches his audience how to make those things at http://imakethings.com. He explains his reasons for videblogging:

> I am an artist and I wanted to share the "I love you project" with more people than could see it in a gallery… I have two jobs in life, being creative and supporting other's creativity.

Last year he was a middle school teacher and used videoblogging in his art and writing courses. Mr. Pettis formed http://room32.com to teach people and to give his audience more opportunities for self-expression. He created those vlogs to share them with his students, parents and other colleagues. He created many vlogs to inform students about their future projects in the class, collecting their works in a video and share them with the community. He prepared a videoblog “in the future” in which his students made some predictions about the future. Mr. Pettis comments on his experience:

> That was just something to do in the last 10 minutes of class one day. You can tell they felt comfortable taking creative risks in my class, everything from living on the moon to we will all die, world war three…I am proud of that video, it was really the best collaboration and a lot of my videos for room 132 are news-style updates with student work.

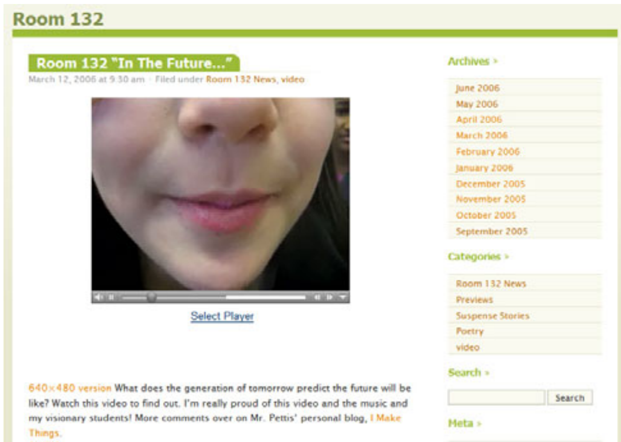

Figure 1-“In the Future…” vlog at http://room132.com/2006/03/12/in-the-future/

Mr. Pettis recorded those videos with the help of his teaching assistants. He explains his reasons for doing vlogs in the classroom:

> For me as a teacher the important parts were to document what I was doing and share it, let the parents know what was going on in class, and getting a bigger audience than my 150 students.

Mr. Pettis shared students’ works on Animated Flip Books by doing vlogs about them and publishing at Room 132. Parents, other teachers and students watch this vlog and make comments on it.

Figure 2- Animation Flip Books Vlog at http://room132.com/2005/11/19/room-132-animation-flip-books/

According to Mr. Pettis teacher-created videoblogs and student-created videoblogs are two different educational practices and they have different dynamics in their applications. He stresses the impracticality of student-created videoblogs in schools which have limited technology infrastructures.

Students as videobloggers

Jonny Goldstein is one of the leading practitioners in videoblogging field trying to promote the use of videoblogging in educational practices. He is also an early adopter of videoblogging technology, publishing his first videoblog in December 2004, the time when people started doing videoblogging. He started doing videoblogging for personal reasons after he attended vloggercon (a yearly conference aimed at bringing videobloggers together, http://www.vloggercon.com) held in December of 2004 and he "fell in love" with this new technology. He talks about his reasons for videoblogging:

> It was a natural for me. I already was text and photo blogging partly because I enjoy expressing myself in text and images, partly to let my friends and relatives stay up to date on what I was doing, and partly to professionally promote myself starting in autumn of 2004. I was starting to perform a lot of stand-up comedy so it made sense for me to make funny videos to get my stuff out there.

He started doing videoblogging for educational purposes on October 2005. Although he was not a certified regular classroom teacher he had been working intermittently in various education-related jobs, working as a substitute teacher in the New York City public schools and as a theater, art, and music teacher in an afterschool program for a couple of years. His videoblogging practices for educational purposes started with his job as a project director for a private company, which was in the business of doing robotics, interactive multimedia, digital audio and digital video with children. The BX21 Videoblogging Project is made by Vision Education and Media and SOBRO and is financed by a 21st Century Community Learning Centers Grant (http://vemnyvlogs.org/bx21/). The aim of the project was to make students to get ready for the work world and to connect school and real life with the technology component. Mr. Goldstein directed this project and worked within the campuses of five of the schools involved in the project.

> Students were volunteers and it was free and most of them were low income. Class size was varied from 15 to 4-5 active participant kids who would meet two afternoons a week. Kids usually did the videos as group projects so what was the aim of the program.

According to Mr. Goldstein the educational benefits of videoblogging are developing students communicational skills through storytelling, enhancing their visual literacy, improving their technical skills and learning how to blog to use a social software. The topics of the vlogs that students prepared as part of this afterschool project reflected the very benefits of videoblogging on student self expression and learning. For instance, a student prepared a short clip for a documentary which was about attitudes toward homosexuals by conducting interviews with his classmates, the other student prepared a video clip to do a review of a game and others did an opinion piece about school lunch.

Mr. Goldstein also talks about some of the challenges they encountered during the videoblogging activities in classrooms such as technical difficulties with uploading videos in the school labs due to the security settings , getting releases from the parents to put vblogs online and paying attention to ethical issues such as safety and privacy. Mr. Goldstein summarizes the precautions to be taken while incorporating videoblogging activities into classroom practices effectively:

- Have a good release prepared and get it signed.
- Discuss what is and is not appropriate with the students before they put work online.
- Discuss the Internet safety with students. Ask students not to use their last names and let you know if anyone left them an inappropriate comment or tried to contact them on the Internet.
- Review students' work before they post it online.

Although using videoblogging in classroom settings poses some challenges to teachers, today the young generation is much more comfortable with the technology, and technology is already integrated into their lives. In order to meet students' needs, educators need to be familiar with and incorporate new technological advances into their classroom practices. Mr. Goldstein makes some predictions about the future of videobloging:

> Teens or college students now are going to be way more comfortable with technology, "Do-it-yourself media social software", so it's going to shift; we're just at the beginning. More wireless connectivity, cheaper and better cameras, higher bandwidth connectivity…This means more people will be shooting video and putting it online everywhere…I think schools have got a big challenge, they are already in, because technology is changing so fast and their students are going to be the experts

Mr. Goldstein considers teachers' role in videoblogging activities as being guides who facilitate students' videoblogging activities. Creating a learning community in which both students and teachers learn from each other, communicate and contribute to the teaching-learning process, videoblogging is likely to engender valuable educational outcomes. Mr. Goldstein at "We are theMedia" blog (http://wearethemedia.com/2005/10/25/videoblogging-in-education) gives some examples of educational use of videoblogs. He also proposes that teachers might place videoblogs on the Internet in a way that only selected viewers can have access to them with password-protected blogs. Therefore, teachers will be able to reduce security problems and feel much more comfortable in incorporating videoblogging into their classroom activities.

Videoblogging as a promising educational tool

Videoblogging offers rich experiences both to the teachers and students who want to communicate with movies, sounds and images, reflect on what they teach, learn and think and share them with a community. The possible educational benefits and uses of videoblogging activities are summarized below:

- *Meeting the learning needs of students*

Today's digital native students are born in this technology-rich society and have had closer contact with multimedia tools already. What they see and perform outside of the schools should be reflected in educational practices to answer their learning needs. Videoblogging can be used as a tool for meeting the needs of students from diverse backgrounds. Learners come to learning environments with their prior knowledge, unique characteristics and beliefs. Incorporating videoblogging activities into classroom settings will create opportunities for children to build their knowledge onto their unique prior understandings and different learning styles.

- *Videoblogs as a tool for reflection on learning:* Students' cognitive abilities can be enhanced with videoblog reflections, in which they come to realize what they know, what they learned and what they can learn in the future.
- *Videoblogs as a way of demonstrating understandings about variety of concepts:* Videoblogging can be used as a way to express variety of subjects and concepts. Learning by design approach can be used with videoblogging activities in which students create the meanings through the design processes of vlogs. Videoblogs can be part of design projects in which multiple intelligences are used effectively, students' higher order thinking skills are developed, and problem solving abilities are enhanced through the creation of a product for a real audience (Kahn & Ullah, 1996).
- *Videoblogs as a tool for collaborative work, creating learning communities:* Hoem (2004) stresses the importance of the function of videoblogs as wikis on the creation and production of collective videos. During vlog production phase, students may work together to design their documentaries and enhance that process by sharing their work on videoblogs with other students, even the people outside of the class. Their learning space can expand the borders of a classroom, creating new types interactions between them and the society.
- *Videoblogging for digital storytelling:* Digital storytelling has been considered as a powerful method for engaging students and teachers through telling their stories with multimedia tools such as images, audio, video and web technologies. "The use of videoblogs for digital storytelling may be one way to encourage strong student participation in e-portfolio projects" (EDUCAUSE, 2005*).*
- *Videoblogging for improving media literacy:* Today we are surrounded by messages that are being conveyed in variety of forms. Media tools have been evolved over time from printed materials to highly interactive channels such as audio-visuals and the Internet. To become competent in this highly rich communicational environment, to understand and interpret messages and to create the messages by using media tools, students should have media literacy skills. Videoblogging may serve as a strong educational tool by providing students with rich opportunities to reflect on messages being conveyed and in the creation of their own messages.
- *Videoblogging and student journalism:* Citizen journalism has emerged with new technological advances that allow ordinary people to be actively involved in the creation and dissemination of the information and news to the rest of the world. Instead of passively demanding ready-made news, now anyone with some basic internet knowledge can be a journalist who can share his/her personal information or news with the audience. Encouraging students to be citizen journalists will help them understand their environment better, criticize ready-made structures and thus take the very first steps of being active citizens in the democratic society. Videoblogging when used as a tool for student journalism can be a powerful tool for helping them convey information and news that they think important for others to watch, think and reflect on.

Videoblogging and Technological Pedagogical Content Knowledge (TPCK)

In order to overcome the challenges that teacher face today in integrating integrate technology in their classrooms appropriately, Technological Pedagogical Content Knowledge (TPCK) has emerged as a new vision in teacher education field addressing the "form of knowledge that goes beyond all three components (content, pedagogy and technology)" (Mishra & Koehler, 2006, p. 1028). TPCK framework focuses on technology integration into specific curricular topics with the selection of particular pedagogical techniques. Teachers need to consider the interactions between technology, pedagogy and content in their videoblogging classroom activities. Bull et al. (2007) state that "digital video technologies offer unique opportunities (through interactivity and user-generated content) to rethink the instructional paradigm particularly to match the needs of the subject to be thought" (p. 3). They give specific examples of the integration of digital video technologies into different disciplines with different pedagogical goals.

Table 1
An Illustration of Linking a Technology (Digital Video) with Pedagogical Goals in Different Content Areas (Bull et al., 2007, p. 6).

Discipline	**Content**	**Technology**	**Pedagogical Goals**
Science	Physics	Digital video	Rectifying Naïve Conceptions
Physics	History	Digital video	Supporting Historical Inquiry
Language Arts	Reading	Digital video	Reinforcing Visual Imagery
Mathematics	Trigonometry	Digital video	Connecting Representations

Similarly, videoblogging technology can be integrated in different content areas with different pedagogical goals with a focus on its affordances of publishing and sharing digital video content on the Internet and constraints of safety and privacy issues. If teachers consider the interactions between pedagogy, content and technology in their videoblogging classroom activities, they can offer unique learning opportunities to students.

Conclusions

Videoblogging activities can meet the needs of today's students who are surrounded with these highly dynamic and interactive technologies already. Students' interaction with producing and publishing media and sharing it with a community can improve their communicational and technical skills which are required for them to be successful and competent citizens in the society. When used effectively in educational settings, videoblogging may redefine classroom borders expanding learning experiences outside of the school to the community connecting school, students, teachers, administrators and parents in a learning community.

Videoblogging as an emerging tool, a popular trend on the Internet and a new way of media production has a lot to offer for educational settings. Without any doubt, more and more educators will start to experiment this engaging tool in the teaching and learning settings in the near future.

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Stakeholder Organizations, Katrina, and the New Orleans Public Schools

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The public schools in New Orleans have long been believed to be among the worst in any big city school system in the United States. The students are the poorest citizens of one of the poorest cities in one of the poorest states in the country. While the population of the city is approximately 65% African American, the student population in the district is over 90% African-American- a result of continuously failing schools and decades of white flight. In a city with one of the highest rates of private school attendance in the country, 25% compared to 10% nationally (Newmark & De Rugy, 2006), the public schools have been consistently under-funded and neglected. Prior to the storm, the district was led by ten superintendents in ten years and several have left under clouds of suspicion regarding mishandled money. Until the eyes of the nation fell on this city after Hurricane Katrina struck on August 29th, 2005, there had been little political will to improve the failing system.

The nation cringed at the TV news clips of poor African Americans huddled, dehydrated, and dying at the convention center and Superdome waiting for handouts from the government. The embarrassment to the city was real and this may provide the political will to substantially change the public schools in this city. In the aftermath of Hurricane Katrina, the district temporarily lost 100% of its students and didn't open a single public school for more than two months. As it became apparent that the school board was not prepared to bring the district back from such a devastating blow, reformers began to see a silver lining in Katrina's dark clouds. State School Board member Leslie Jacobs said, "The diaspora of New Orleans represents the opportunity to rebuild our public school system" (Inskeep, 2005b). While some saw this as an opportunity to rebuild the system, huge segments of the population were living in Houston, Baton Rouge, Atlanta and hundreds of other places. With the low-income, non-white residents often most affected by the storm, it fell to the educational organizations in the city to lead the debate over how the schools should be reopened. Could these organizations follow through on their promise to improve schooling for the lower-income residents of New Orleans? With leadership structures and educational platforms already in place, these stakeholder organizations (teachers union, school board, etc.) were well-situated to influence the course of events in the tumultuous few months following the storm- would they seize the opportunity? This paper addresses the question: *How did stakeholder organizations respond to the post-Katrina collapse of the New Orleans Public Schools?* Components of this question are:

- Why did groups act when they did?
- What basis did they use to argue for their proposed reforms?
- What successes/failures have groups had in bringing their educational vision to fruition?

In understanding the ways in which various stakeholder organizations responded to Katrina, it should be possible to understand the reasons for the success and failure of certain groups. This may give some insight into the complex social and political forces that surround any effort at changing urban schools. While Seymour Sarason has noted "the intractability of schools to educational reform" (Sarason 1990, p.147), it is possible that schools are not intractable as much as reformers are ignorant of the complexities of changing organizations as complicated as urban schools. Understanding the role of stakeholder organizations in post-Katrina reforms is one small step towards the larger agenda of understanding how urban schools change.

Theoretical Framework

Michael Fullan (2000) addresses the concepts of *cultural* and *structural* change as they apply to school reform. Structural changes involve changes in governance structures (Cuban & Usdan, 2002) and formal leadership roles in an effort to improve the educational outcomes of a district. Cultural change, in this case, involves the active participation of many individuals in the creation of classrooms into places where learning is a shared goal and shared responsibility. Ideally, this type of change involves schools that utilize professional learning communities to examine student work and make appropriate alterations to teaching practice (Newmann and Welhage, 1995; Schlecty, 1990). While cultural change is generally a more powerful agent in the reform of systems of education, it is also the most difficult. Cultural change without a supportive governance structure is both challenging and exhausting (Vibert & Portelli, 2000). Stakeholder groups, especially in the case of post-Katrina New Orleans, are able to influence district structure and make it either accommodating or hostile to the development of professional learning communities which lead to deep cultural changes. This study will examine the roles of five stakeholder organizations and their success in implementing structural reforms in the post-Katrina redesign of the New Orleans Public Schools.

Five Key Stakeholder Organizations

The roles of five key stakeholder organizations will be explored to answer the research questions posed above. While this is by no means an exhaustive list of such groups, they represent some of the more influential groups in terms of their ability to influence the massive post-Katrina restructuring in the district. A brief description and abbreviation for each organization is given below.

1. United Teachers of New Orleans (UTNO)

UTNO is the AFT affiliated teachers union that counted approximately 4700 dues paying members pre-Katrina and less than 300 after the storm.

2. Orleans Parish School Board (OPSB)

The seven-member board that was directly responsible for the operation of 117 schools prior to Katrina and currently oversees the operation of 5 schools. Members are elected to 4 year terms by residents of 7 geographic districts in the city.

3. State of Louisiana

This organization consists primarily of state legislature, the governor, the State Superintendent, and the Board of Elementary and Secondary Education (BESE) which contains 8 elected members and 3 members appointed by the governor. The BESE Board is directly responsible for 102 (mostly closed) New Orleans campuses under the control of the state-run Recovery School District (RSD).

4. Algiers Charter School Association (ACSA)

A community group that created a collection of 14 charter schools shortly after Katrina. This group enrolled about one in five New Orleans Public School students as of September 2006

5. Mayor Nagin's "Bring New Orleans Back" Education Sub-committee (BNOB-ED)

Committee of nearly 70 education policy elites formed by the mayor to develop and present a proposal for the rebuilding of the New Orleans Public Schools.

Data Collection and Analysis

As a former teacher in the New Orleans Public Schools, I began collecting media reports of the post-Katrina school reforms immediately after the storm. As it became clear that the school board would not be able to retain control of the district, and that significant reforms were imminent, my collection of media reports became more systematic. Approximately 150 media reports (both print and radio) have been collected to trace the activity of stakeholder organizations post Katrina. Some federal and state government documents and recordings of public meetings focusing on the school system supplement these media reports. Additionally, public information released by these organizations via press releases, publications, and Internet sites has been reviewed as important primary sources.

Analysis of this data consisted of chronological analysis of the major actions and public statements of each stakeholder organization which indicated the general position of each with regard to changes within the district. When the general position of each of the five groups included here are taken as a whole, it is possible to see which groups have been more effective in translating their vision into reality. Of course, events are still unfolding rapidly in New Orleans, and the groups that have had success influencing reforms at press time are not necessarily the groups that will have the most long-term success. The untimely death of state Superintendent Cecil Picard and the hiring of Philadelphia superintendent Paul Vallas to run the RSD are some of the latest developments. A longer-term study of the results of post-Katrina reforms would certainly help in seeing the true extent of the changes that Katrina brings to the New Orleans Public Schools.

Responding to Disaster

This section traces the actions of five stakeholder organizations in response to Hurricane Katrina on August 29, 2005. In addition to the important actions of each group, a summary of its plan for post-Katrina schooling will conclude each section. In some cases, this plan is a written document which leaves little need for interpretation. In others, the plan has been pieced together and interpreted from organizational actions and public statements.

Stakeholder #1- United Teachers of New Orleans (UTNO)

UTNO called for a quick resumption of classes following the storm. They linked the reopening of schools with the return of population that would galvanize the citywide recovery process. Initially disregarding calls from other groups that extensive redesign of the schools should precede the reopening of the city's overwhelmingly failing schools, union president Brenda Mitchell preferred "that all attention is on the resumption of instruction…" noting that radical changes to the school system "should be put off until a later date" (United Teachers of New Orleans, 2005a). Mitchell admonished the school board's rapid creation of charter schools, blaming the discussion around charters for the delay in reopening public schools for the city's children. The union filed suit in city court on November 8th to force the district to reopen a small number of schools (Ritea & Warner, 2005)

At the state level, Louisiana Federation of Teachers President, Steve Monaghan vehemently opposed a proposal that would have created a state-funded voucher program (United Teachers of New Orleans, 2005b). In November 2005, while the OPSB was busy chartering schools and the state legislature was beginning to consider a takeover bid in the upcoming special session, UTNO released its vision for the re-opening of schools in the flood-ravaged city. Their plan called for the rapid opening of schools that would maintain the same organizational structures and curricula that were in place prior to the storm. The changes they focused on were related to working conditions (class size, building cleanliness) and a call for more ethical behavior from district officials (United Teachers of New Orleans, 2005c). Arguing that the majority of the public school community was physically absent from the city, the union consistently argued that any large departures from the pre-Katrina system would be unwise due to the unavailability of community input.

While this plan serves as an ideological snapshot of what the union wanted the rebuilding process to look like, it quickly became a meaningless plan. UTNO lost nearly all of its power when Governor Blanco signed House Bill 121 that swept over 90% of New Orleans Public Schools into state control- voiding the bargaining agreement that the union had in place with the school board. The union was left to watch passively as the district fired nearly 95% of its dues-paying members in February's post-Katrina budget crunch (Ritea, 2006b). In fact, when the *American School Board Journal* did a feature story on the recovery process of NOPS, they included articles on six different stakeholders in the new district, but union leadership was not one of them (Dillon & Vail, 2006). In September 2006, the school board voted to cease payments to UTNO's Health and Welfare Fund that defrayed medical costs incurred by UTNO members (Ritea, 2006e).

In the end, UTNO sought a reopen-first, reform-second strategy that ignored the desire of the public to overhaul the NOPS in the wake of Katrina. Their calls for the "renaissance, not replacement" of the system sounded to many citizens like calls for the status quo and left it with few allies and little political power following the state takeover. Time will tell if workplace issues in the charter-dominated district will bring about a resurgence of the teacher's union.

Stakeholder #2- Orleans Parish School Board (OPSB)

The OPSB was in dire straits even prior to the destruction caused by Hurricane Katrina. It had hired 10 superintendents in 10 years and diverted money from the classroom to hire a New York consulting firm Alvarez and Marsal to help track down $71 million in unaccounted for federal funds (Inskeep, 2005a). Public trust in the school board was low, and recent scandals involving missing money, continued school violence, and poor academic performance had many people plotting for a way to remove the district from the board's mismanagement even before Katrina.

After the storm, the school board first met on September 15th in Baton Rouge. At the meeting, Board member Phyllis Landrieu suggests inviting former Secretary of Education Rod Paige and retaining Bill Roberti from Alvarez and Marsal to take over leadership of the district (Orleans Parish School Board, 2005). The vote failed, but this shows the school board's lack of confidence in its own abilities to successfully reopen the district. During the same meeting they placed all employees on disaster leave and set a target date of November 1st for the first school reopening. In a forshadowing of things to come, the board also approved a charter for the Lusher Elementary School in a 5-1 vote, The move to decentralize the district was begun by the very people who would have been expected to attempt to maintain control.

At their next meeting on October 28th, the board approved charters for an additional 20 schools with the condition that 20% of the students at each chartered school be eligible for free and reduced lunch (Ritea, 2005a). A federal grant of some $21 million forced the hand of the cash-strapped board to accept the charter proposals despite the feeling expressed by board president Torin Sanders that this decentralization could lead to problems of equity in the district. The district's chartering of its schools was also a response to harsh public criticism for not opening schools when private schools in the city and public schools in hard-hit St. Bernard Parish were already open. Superintendent Ora Watson apologized for the slow opening of schools and pushed the target date for opening back from November 1st to November 14th due to district financial problems.

Eventually on November 28th, the first public school in the city was opened, nearly two months after the storm struck (Ritea, 2005c). Three days later, just like UTNO, the school board was stripped of nearly all of its power when the state took over 102 of it's 117 campuses. Of the remaining 15 schools, seven already held charters with the district, leaving the board in direct control of only 8 schools (Ritea, 2005d). The board, with the state's help, had removed itself from any important role in the short-term future of the New Orleans Public Schools

The district was left with only cleaning up to do once the state takeover occurred. The once-behemoth district now had 61 central office employees instead of 1,200 and operated 3 functioning schools instead of 117 (Ritea, 2006a). In March, the district tried to recover some costs by selling some of its ruined school busses on Ebay as Katrina collectibles (Ritea, 2006c). In April 2006, superintendent Ora Watson announced that she would not seek an extension of her contract after it expired in July. This guaranteed that the much-smaller district would be led by its 11th superintendent in a decade.

Stakeholder #3- State of Louisiana

Six weeks after Hurricane Katrina struck New Orleans, Jay Dardenne, a state senator from Baton Rouge said, “I don't want to rebuild those failing schools” (Anderson, 2005a). It was clear that state lawmakers saw this as a golden opportunity to rid the state of an under-performing school district that had been an embarrassment for decades. In the state's most attractive city for outside investment, business balked at moving to New Orleans partly because of the decrepit condition of its public schools. Leslie Jacobs, an at-large member of the state BESE Board stated, “It's hard to find a silver lining from Katrina, but one silver lining is that the school board can start anew. And if any school district needs to start anew, it's Orleans" (“New Orleans wants to rebuild schools”, 2005). With public support for the school board waning as schools opened up in other hard-hit areas, the state passed House Bill 121 on November 30th, which moved 102 of New Orleans' failing schools into a state-run Recovery School District (RSD). The state would have until May to submit a plan for operating the 102 schools. After five years, progress would be assessed and some schools could be returned to the board. At the bill signing ceremony, Governor Blanco summarizes the state's position well: "We see an opportunity here to just do something that is incredible" (Anderson, 2005b). Depending on one's point of view, that something incredible could be dismantling the professional community of the New Orleans Public Schools, or ridding the city of an inefficient bureaucracy and paving the way for change. In either case, the state was moving forward, and with its constitutional power, there was little meaningful opposition to the takeover. Change, in some form, was imminent.

Stakeholder #4- Algiers Charter School Association (ACSA)

A mere five weeks after the storm, ACSA petitioned the board to create charter schools in the relatively undamaged West Bank section of the city, which is located across the Mississippi River from downtown and did not get the standing water that caused most of the damage in other areas. The school board approved a single charter, granting control of all 13 public schools on the West Bank to the Algiers Charter School Association. The ACSA board, consisting of New Orleans educators and West Bank residents, approved a $22.6 million budget on November 4th. This budget called for opening up eight schools by January for up to 5,400 students on a citywide open-enrollment basis (Ritea, 2005b). ACSA, like OPSB, hired New York turnaround consultants Alvarez and Marsal to help plan their recovery process. After some delays, schools opened on December 14th with 1,324 students attending classes at five schools. OPSB had opened its first school on November 29, but by September 2006, ACSA would expand to eight schools and serve nearly one-in-five NOPS students. Despite critiques that the lack of a union contract and ACSA's utilization of a basic skills test for teaching applicants (Polier, 2006), this district-within-a-district has had fewer of the problems with supplies, staffing, and student violence that have plagued the state-run schools. Their vision provided an appealing alternative to many, combining local control with promises made by long time New Orleans educator and ACSA CEO Brian Reidlinger that these schools would be different than they were pre-Katrina.

Stakeholder #5- Mayor's Bring New Orleans Back- Education Committee (BNOB-ED)

New Orleans Mayor Ray Nagin was a fixture in the national media following the Katrina disaster and gained notoriety for the abusive language he directed at the Bush administration and his "chocolate city" comments aimed at appeasing black residents who felt they were being pushed out of the rebuilding process. As a part of his rebuilding efforts, he created seven volunteer committees to guide the city's initial actions following the storm. One of these committees was the BNOB-ED led by Tulane University president, Scott Cowen. This group had 20 members on its steering committee, most of whom were business and education elites in the city. The biographies of this group, ranging from university administrators, to K12 principals, to state education officials led them to undergo a thoughtful process of examining what the storm meant for NOPS, researching other urban school reform efforts, and proposing a detailed report on suggestions for reforming the district in the wake of Katrina.

They held three public meetings in New Orleans that encouraged public participation. Their first meeting on November 19, 2005 attracted about 50 participants (Bazile, 2005). In addition, they collected school improvement data from 1,500 parents, teachers, and students through telephone and electronic communication with displaced residents. At this meeting, committee chairperson Scott Cowen noted the long-term aspect of their mission: "Most of the dialog has been about who will control the schools, not who will plan for the school's future" (Bazile, 2005). The committee worked though November and December to draft a plan, eventually dubbed the "educational network model" that they believed would address some of the inefficiency and inequity of the old system. After several public meetings to collect feedback on the plan, it was submitted to the Mayor and presented for public comment on January 17th, 2006. Of course, during the process of creating the plan, control of the district had moved away from the school board and towards the state and the charter operators. So instead of pitching their idea to a single institution, they had to address a patchwork of groups that all controlled pieces of a somewhat balkanized educational landscape. Scott Cowen's worries about battles for control superseding educational improvement seemed quite appropriate at this point. While their educational network model included input from many residents and adopted successful practices from other urban districts, without formal power, their plan simply died. The state may, in the future, decide to implement portions of the BNOB-ED plan, but it also has complete authority to ignore it.

Findings

Based on this analysis, the reactions of stakeholder organizations to Hurricane Katrina appear in several cases to have somewhat more to do with maintaining or winning political control of the school system than with improving the academic success of New Orleans students. The self-interest of many of the stakeholder groups and their need for self-preservation or political influence is the central finding of this study. This finding is consistent with other studies of curricular change (Kleibard, 2004) and those who study complex social systems (Hutchins, 1996). But this is not a story of mindless land grabbing by these stakeholder organizations. There may be a specific effect of Fullan's (2001) *structure/culture* dualism at play here in that the organizations who were successful in gaining access to the structure of the district were, in most cases, those who proposed a new vision of the culture of the school system. Perhaps the conservative nature of the educational system maintains its current structure unless overwhelmingly convincing visions of a new organizational culture can be expressed by a particular group. An examination of each of my three original research questions shows this in more detail.

Findings #1: Why did groups act when they did?

It appears that stakeholder groups with traditional power (school board/union) did *not act* immediately. They were slow, bureaucratic organizations that were unprepared to lead the district prior to Katrina, and even less prepared to do so after. Contentious relationships between the school board and the union prior to the storm left the city without any unified political coalition that could organize around the rebuilding efforts of NOPS. Despite some posturing that both groups intended to lead the rebuilding of the school district, neither did anything significant and both are now significantly weaker organizations than they were before the storm. These two groups failed to act because they were bureaucratic monopolies and weren't accustomed to doing *anything at all*- even in the best of circumstances.

ACSA and mayor's group formed when it became obvious that the board couldn't re-open the schools. In the silence cause by the school board's slow response, these two new groups formed- desiring to significantly reshape the system of public education in New Orleans. To be sure, ACSA was spurred on by the federal government's announcement of a $21 million grant to support charter schools in hurricane affected districts- a highly political move consistent with the Bush administration's market-based school reform policies. But ACSA also formed in response to a desire to get out from under the stifling bureaucracy of the top-heavy school district. They were escaping the ineffectual policies, which their charter application refers to as "a one foot thick set of documents that have not been reviewed for consistency and necessity in the past 20 years" (Newmark & De Rugy, 2006). In a sense, they were seizing this opportunity, while the district was in a moment of weakness, to secede from the union.

Similarly, the mayor's committee seized on this break from business as usual to plan a completely redesigned district. Led by educational elites and including feedback from 1500 citizens, they engaged in the process of redesign very much akin to the idealized design process explained by Banathy (1992). They acted because they realized that the system as it existed prior to Katrina was dead, and they sought to ensure that sufficient thought was put into the redesign of the new system. This group stands alone as the only stakeholder group in this study that did not make an overt grab for power during the first six months following Katrina. They shared their final plan with the community on January 17, 2006 and have since retreated from the limelight as the state and other groups have carved up the district and ceased to examine the system as a whole.

Finally, the state had desired to increase its control over NOPS prior to the storm, and used the power-vacuum to carry out its takeover plans. State takeover was not a new idea in Louisiana, as the state attempted to take over NOPS in 1960 to prevent federal desegregation orders (Inger, 1969). The traditional argument preventing state takeover was that local people were best suited to solve local problems. Now it seemed that local people had more serious issues of housing and economic stability to worry about. Conveniently for the state any political organizations that might have protested such a move were temporarily unable to mount any opposition. The state used this opportunity to amend the pre-existing takeover law and place most of the district under its direct control.

Findings #2: What basis did stakeholder organizations use to argue for their proposed reforms?

Equally as important to understanding the process of urban school reform is the rationale each group gave for their post-Katrina reforms. The teachers union argued that immediately opening schools would bring back population (and help the economy) as well as serve to bring the community together in this time of need. This basis looks past efforts to radically alter the pre-existing system and focuses on the need for immediate school reopening. This would be expected as the union's role is protecting the interests of its members, all of whom were without pay as long as schools were closed.

The school board acknowledged that they could not adequately bring the district back, and that schools would be back faster, and perhaps improved more readily, with independent leadership. The fact that the board was in serious financial straits prior to the storm led them to the position that they were unable to bring the district back even to where it had been. Federal charter money and the intense public interest in new reforming their schools made new leadership appear as the best route to ensuring the education of New Orleans' returning children.

ACSA, in the process of gaining control of 13 schools under its single charter, argued that a community run, low-bureaucracy school system would serve students better than the old system. They would be able to manage a much smaller budget and staff and avoid much of the mismanagement that plagued the pre-Katrina district. Embedded in their argument is a version of the local control argument that says that problems can be solved better by those who are closest to them. This argument resonated well in a city that had been ill-served by a centralized school board and had been left to drown by FEMA's bungling antics in response to Katrina.

The mayor's committee argued that a broad base of input and careful, centralized planning was needed as part of a comprehensive plan to overhaul the district. Committee members knew that this was a once-in-a-century event that provided a unique opportunity to intervene in the downward spiral of the New Orleans Public Schools. This rationale resonates with Kurt Lewin's (1951) notion of freezing and unfreezing in organizational change. It could be argued that Katrina's aftermath was a period when the relatively rigid structures of the district were malleable and that soon after the return of the population and the re-opening of schools, the district would refreeze into a new rigid structure. Thus, making the most of this opportunity was essential to the mayor's group.

Finally, the state of Louisiana had always viewed New Orleans schools as an embarrassment and an economic hindrance. Now was the time for the state to exercise its constitutional power to take direct control of the district. This was a move that would put the burden of running the troubled system on the state, but would move the management of the system away from the local political infighting that they assumed to be a cause of the problems. Embedded here is that a rational, resourceful government can manage affairs better than locals who are blinded by everyday affairs, which can, admittedly, get pretty blurry in the city of New Orleans. This argument, of course, is not new- and was made often in the early part of the 20th century to eliminate inefficiency from school systems (Tyack & Cuban, 1995).

Findings #3: What successes/failures have groups had in bringing their educational vision to fruition?

There has been a great imbalance between what groups have been successful in getting their vision implemented, much of this having to do with political power and the ability to compose a reform message that was pleasurable to the ears of decision makers. The union and the board had no credibility due to their past failures in reforming the district. It appears that the board's mission may have been merely to divest itself of much of its authority in the district, in which case they were *quite* successful at implementing its mission. This does not, however, give much power to their educational vision, if their even was one. The union continued to harass the actions of others, but not engage in any sort of helpful dialogue with the district that has made other urban reforms successful (Urbanski, 2000). Thus, they have been pushed aside and serve as representatives, but not an important force in guiding the direction of the district.

The Mayor's committee brought national media attention and harnessed the support of recognized educational experts in formulating a massively revised plan for NOPS. But, they had no formal power and since the state take over, little of their plan has been implemented. As the state looks for guidance in running a school system (Nelson, 2006), the committee's "educational network model" may come back, but as of this writing, it has been put on the shelf.

The state and ACSA have had the most success in getting their educational vision for reform implemented. ACSA has done this by being the first major chunk of schools to be up and running and doing a reasonably good job of educating 1 in 5 of New Orleans students. The state has exercised its constitutional authority and controls the largest number of schools, but what exactly the state's influence will be is largely uncertain. The opening of schools in Sept. 2006 was fraught with problems in the state-run schools (Saulny, 2006; Ritea, 2006e) and state-appointed RSD superintendent Robin Jarvis announced her resignation in May 2007 after about a year on the job.

Conclusions

In this case of urban school reform initiated by a natural disaster, stakeholder organizations reacted in a number of ways, from divesting of authority, to creating sub-districts, to engaging in dialogue about what a new system might look like. In this case, it appears that most of those who put forth visions of a *new* system have gained some measure of control in the post-Katrina era educational landscape. In other words, those who successfully espoused a particular *cultural change* within the district where often successful in achieving some of the structural changes that they sought. The union and the school board did not propose significant alterations to the practice or function of education in the city, and have thus been pushed to the margins of the educational community.

ACSA, the state, and the mayor's committee all have put forth visions of a new educational system and all have found some purchase in New Orleans. ACSA's regional charter system represents an experiment as an urban K12 charter school district and has been sanctioned by the state to continue its operations as long as academic achievement does not falter. The state has taken over one-hundred buildings (half of which are empty) and is granting more charters as well as running some schools itself. As of November 2006, the district is approaching half of its pre-Katrina enrollment: 36% of the students are enrolled in independent charter schools, 18% in the ACSA charter network, 35% in the state-run RSD, and 11% in the few remaining district-run schools (see Figures 1 and 2).

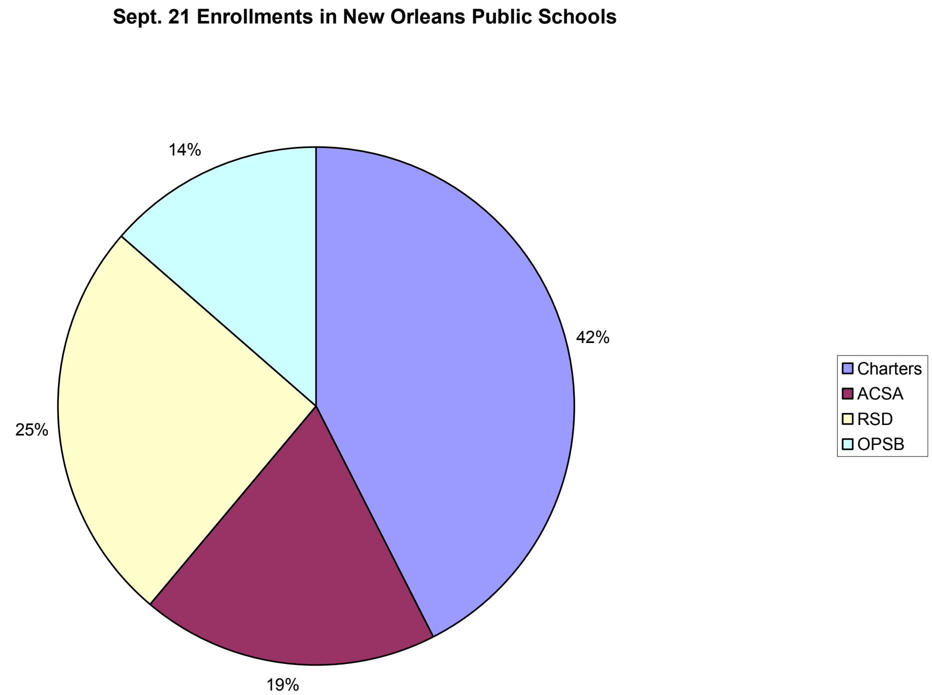

Figure 1 Enrollment in New Orleans Public Schools September 21, 2006

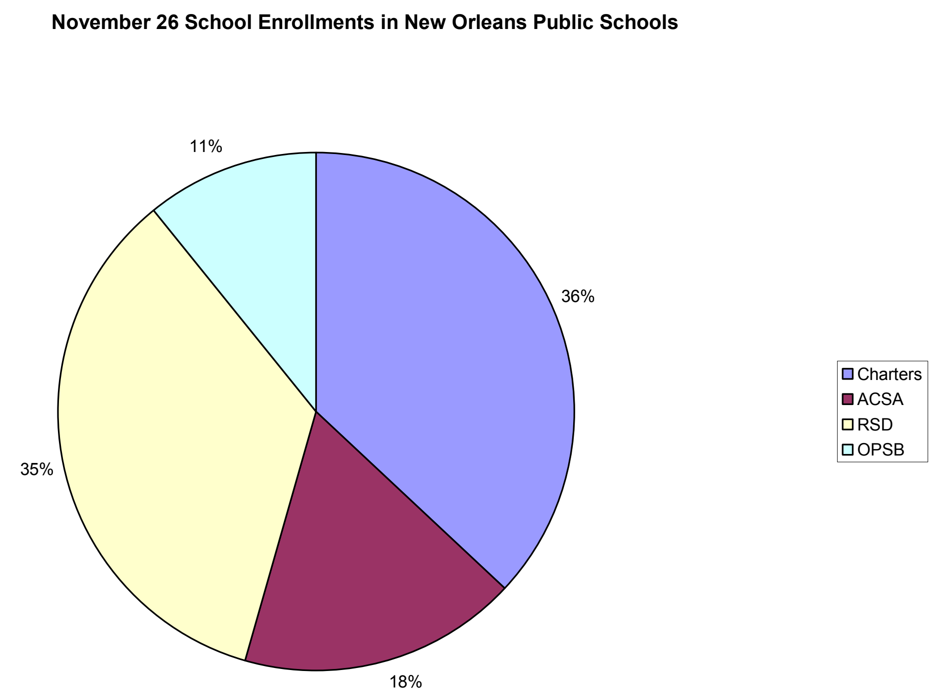

Figure 2 Enrollment in New Orleans Public Schools November 26, 2006

What this patchwork quilt of educational options may tell us is that different theories of reform and different ideologies might exist within the same city, even the same district- if the "district" is conceived broadly enough. The opportunity to make substantive cultural changes in urban classrooms may also require the ability to carve out some space within the bureaucratic structure to enact those classroom and school level changes. This finding may support the type of loose-coupling (Weick, 1976) between districts and individual schools that allows both district-level support and freedom for schools to experiment. This is a structure that has been popular with urban reformers promoting magnet schools and vouchers in the past (Dougherty, 2004). It should be noted that such a structure was recommended by the mayor's BNOB-ED committee in their "educational network model." Time will tell if such a district model will be implemented in New Orleans and further research is required to determine if the structural changes already made will indeed lead to the cultural changes which have been proposed. To be certain, the citizens of New Orleans are watching this experiment closely and the preliminary results of nation's largest experiment in urban school choice will be made public when school report cards come out in summer 2007. Until then, we can just continue to watch as events unfold.

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Conflicts in Human-Computer Interactions: A Framework for Designing Effective Message Exchange between Humans and Pedagogical Agents

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Abstract

We present guidelines for improving real-time interactions between learners and pedagogical agents. We argue that learners treat virtual characters as human counterparts and are often frustrated with pedagogical agents' interactional capabilities. To improve the way agents interact with learners, we draw on guidelines that have proven to be effective in human-human communication literature and apply those to the design of pedagogical agents.

Researchers have long predicted the integration of artificial intelligence characters in curricula to assist in student learning. Such characters have been termed pedagogical agents and can be defined as human-like virtual characters employed in electronic learning environments to serve various instructional goals (Baylor, 2002). Even though advances in hardware and software have enabled the use of pedagogical agents in educational circles, conflicts arise when students hold real-time conversations with pedagogical agents. Most notably, learners become frustrated with pedagogical agents and frequently express negative feelings when a virtual character does not respond in the way that learners expect. The following quote from a participant in a study conducted by Doering and Veletsianos (2007) illuminates such feelings:

> I hated Joan or whatever the super-agent lady was called. She asked me at one point, 'Are you testing me?' like we were going to have some sort of a confrontation or something. I've never wanted to hurt a digital person before!

Given that the assimilation of virtual characters in electronic learning environments is expected to continue (e.g. Federation of American Scientists, 2006), an investigation of how to foster effective interaction between humans and agents appears to be worthwhile. Even though researchers have already made disjointed attempts to enhance the interactional capabilities of agents such that they appear cooperative, polite, friendly, and knowledgeable, this paper proposes an extensive framework for the design of agents' interactional capabilities. This framework is derived from a model of effective human-human communications and is applied to the design of conversational systems. To the best of our knowledge this framework is the first instance of a well-rounded approach to the design of pedagogical agents' interactional capabilities.

In this paper, we will provide a review of pedagogical agents, explain the conflicts that arise when learners interact with pedagogical agents, and provide a framework to reflect upon and guide the design of effective agent-learner conversations.

Pedagogical Agents: A Review

Pedagogical agent research has been expansive. Researchers from varied fields such as educational technology and psychology, human-computer interaction, computer science, design, and linguistics have examined aspects of pedagogical agents with regards to numerous facets of interest including learning, teaching, and cooperation. Such research has so far been predominantly experimental and quasi-experimental (Mahmood and Ferneley, 2006), striving to discover cause and effect relationships, and measure the impact of various virtual character features (e.g., instructional role, gender, voice) on a number of quantitative variables (e.g., performance, perceptions of agent traits). It is also important to note that pedagogical agent integration transcends the content-area in which pedagogical agents are used. For example, pedagogical agents have been utilized in the study of economics (Baylor & Ryu, 2003), physics (Lester et al, 1997), nanotechnology (Hershey-Dirkin, Mishra, & Altermatt, 2005), computer literacy (Graesser et al., 1999), and mathematics (Baylor, Shen, & Warren, 2004).

One of the theoretical arguments used to support the integration of pedagogical agents in education is that they can enact socio-cultural aspects of learning (Gulz, 2004), in effect enhancing social interactions (Vygotsky, 1978) between learners, teachers, and computers. In other words, previous work suggests that social interaction between learners and between teachers and learners may enhance learning, and this work is often applied to the use of pedagogical agents. Previous studies have presented overwhelming experimental evidence showing that humans treat media as if they were human, proposing that our responses to media are inherently social in nature (Reeves & Nass, 1996). This evidence has been replicated in both phenomenological settings (Veletsianos, 2006a) and longitudinal qualitative studies (Doering, Veletsianos, & Yerasimou, in press). For example, one of the research studies presented by Reeves and Nass (1996, p. 53-58) begins with the understanding that in real life people think better of people who praise or flatter them than people who make no evaluation. Transforming this psychological finding to a human-computer interaction context, it implies that people will like the computer more when it flatters them about their work than when it does not say anything at all. Reeves and Nass tested this hypothesis by devising an experiment where the computer either flattered or said nothing to participants after the completion of a task. Results showed that participants who were flattered thought that they did better on the task and liked the computer more than participants who were not flattered, even in the cases were the flattery was insincere.

These results suggest that if humans treat computers and media as if they are human, social interaction between humans and computers is expected to approximate social interaction between humans and humans. Additionally, if the computer is represented as a human-like character able to dynamically converse and interact in real-time with the user the distinction between human-human and human-computer interaction may become even blurrier (Veletsianos, 2006b). Holtgraves et al. (in press) provide support for such a hypothesis by presenting experimental evidence indicating that participants viewed conversational software systems as encompassing human-like personalities. For example, a character who responded quickly was perceived to be more conscientious and extraverted than a character who did not respond as quickly, leading the authors to argue that, "perceptions of the bot were influenced by communication variables that have been demonstrated to influence perceptions of human communicators" (p. 10). This finding further implies that humans would expect their interactions with media and conversational systems to abide by human norms. It follows that an examination of effective communication between humans and humans may be beneficial in informing designers with regards to effective communication between humans and computers.

Human-Computer Interactions: Defining the Conflict

Conflicts are ubiquitous. From a misunderstanding between colleagues, to an argument between spouses, to an internal struggle, to differing opinions between countries, everyone has at one point or another experienced a conflict in their life. This outlook of conflicts is exemplified by Deutsch (1973) who notes that a conflict exists whenever incompatible activities occur. An incompatible activity is one that "prevents, blocks, or interferes with the occurrence or effectiveness" of a second activity.

Even though Johnson and Johnson (2003) are concerned with how to resolve intrapersonal, interpersonal, and intergroup conflicts, incompatible activities occur when humans interact with computers. The Johnson brothers (2006, pp. 370-371) define a conflict of interest as an interpersonal conflict that exists "when the actions of one person attempting to maximize his or her benefits prevent, block, interfere with, injure or in some way make les effective the actions of another person attempting to maximize his or her benefits" This definition can be extended to human-computer interaction and defined broadly as follows: An HCI conflict occurs when the actions of the computer trying to achieve goals prevent, block or interfere with a person's attempt to achieve goals. More specifically for the purposes of this paper, an HCI conflict can be operationalized as a conflict that occurs when the actions of a pedagogical agent trying to achieve educational goals prevent, block, or interfere with the learner's attempt to achieve educational goals.

One of the issues that keeps resurfacing in the pedagogical agent literature is that the interactional capabilities of pedagogical agents and the technology behind intelligent tutoring systems are not yet capable to enable effective human-computer interaction (Doering, Veletsianos, and Yerasimou, in press; Gulz, 2004). For example, when agents do not "know" the answer to a question, they may respond in a multitude of ways including avoiding to answer questions, mocking the user, questioning the user's intentions, and respond by using generalized and out-of-context comments. Additionally, valid agent responses may not conform to human-human conversation norms, oftentimes appearing to be defensive or even aggressive.

Improving Agent-Student Interactions: A Conflict Resolution Approach

Johnson and Johnson (2006) note that there are two ways to manage conflicts – constructively or destructively. Resolving conflicts constructively leads to numerous beneficial outcomes including strengthening liking, respect and mutual trust, while resolving conflicts destructively leads to anger, resentment and distrust. The Teaching Students to be Peacemakers (TSP) program proposed by Johnson and Johnson (2003) is based on the understanding that conflicts exist in schools and that without training, students tend to resolve conflicts destructively. The TSP program provides an extensive framework to train students to solve conflicts constructively. The program has been widely implemented and researched and it appears to be an effective intervention for the constructive resolution of conflicts in school settings (Johnson and Johnson, 2001). In the TSP program, students are required to work cooperatively, negotiate with each other, mediate conflicts, and problem solve in order to reach a constructive resolution of the conflict. These actions however require students to effectively communicate with each other. Effective communication is defined as the situation "when the receiver interprets the sender's message in the same way the sender intended it" (Johnson and Johnson, 2006, p. 133) and it is paramount for the smooth functioning of groups. Given that implementations of pedagogical agents in the classroom often require the collaboration between agents and students, effective communication between students and agents is vital if we our goal is to attain meaningful and worthwhile agent-student interactions.

Effective communication between individuals appears to be one of the cornerstones of managing conflicts constructively and as such Johnson and Johnson (2006) present guidelines on how individuals can engage in effective communication by sending effective messages (Table 1).

Table 1: Guidelines for sending messages effectively

Guideline	Description
1	Clearly own your message.
2	Establish your credibility.
3	Make your messages complete and specific.
4	Make your verbal and nonverbal messages congruent.
5	Be redundant.
6	Ask for feedback.
7	Make the message appropriate to the receiver's frame of reference.
8	Describe your feelings by name, action, or figure of speech.
9	Describe other's behavior without evaluating or interpreting.

Therefore, if humans treat media as humans, the theory implies that these guidelines should also work in the design of pedagogical agents. Specifically, these guidelines are important in the design of messages to be delivered from the agent to the learner because they have been shown to be valid in human-human communication. Hence, we propose that these guidelines should be examined more closely in the design of pedagogical agent responses. In the paragraphs that follow, we will examine each guideline from the agent's perspective and explain how it can be used in the context of human-computer interactions.

Clearly own your message

In sending effective messages, students are encouraged to take ownership and responsibility of their statements by using first personal pronouns such as "I" and "my." The use of phrases such as "some people believe that" or "most people note that" may indicate a refusal to acknowledge ownership and responsibility of a comment. Such comments appear too generalized, without indicating to the receiver the source of such messages. Applying this guideline to pedagogical agent message design implies that the agent should establish ownership of the message and take responsibility for the response. In other words, the agent needs to be clear in that the comments (s)he makes come from him/herself.

Establish your credibility

Credibility refers to the perceptions of the receiver regarding the sender's messages trustworthiness. According to Johnson and Johnson (2006, p. 136) a credible sender is one who is perceived to be "(a) reliable as an information source, (b) motivated to tell the truth, (c) warm and friendly, (d) trustworthy, (e) in possession of expertise, and (f) dynamic." In human-computer interaction contexts this implies that the human should perceive the computer to be trustworthy. This is a delicate guideline that has been hotly debated in the HCI literature (e.g. Fogg and Tseng, 1999), with a set of related website credibility guidelines proposed by the Stanford Persuasive Technology Lab. In line with the credibility guidelines proposed by Johnson and Johnson, credibility can be established when the learner perceives the agent to fulfill the six characteristics presented above. It is important to note that these characteristics can be fulfilled not only by modifying message design (e.g. appearing warm and friendly by affectionately greeting the learner) but also by adjusting the looks of the agent (e.g. a formally dressed professor may appear to be more knowledgeable than a green parrot).

Make your messages complete and specific

In communicating about ideas, feelings, and opinions, students should use statements that are clear and inclusive of all necessary information needed by the receiver to understand what the sender is trying to communicate. Completeness and specificity are important but when we communicate with others we usually do not indicate our frame of reference, assumptions, or the leap of thinking we are making. For effective communication to take place, our statements should be expansive and, ideally, should include what we otherwise would have failed to state. In human-computer interaction settings this guideline implies that the agent should give specific and complete responses. Such responses should be specific in the sense that they should not be plagued with assumptions about the learner or about the knowledge of the learner. Additionally they should encompass the frame of reference from the agent's point of view.

Make your verbal and nonverbal messages congruen

In human-human communication participants interact with both verbal and non-verbal messages. Frequently, these messages are congruent – verbal messages match nonverbal messages. For example, a "Hi, my friend" accompanied by a smile and a pat on the back indicates the greeter's positive emotions. If the "Hi, my friend" was followed by a sneer on the greeter's face, the meaning of the verbal information might change because of the co-existence of contradictory messages. Therefore, in human-human conversations verbal and nonverbal messages should be congruent so as to avoid misunderstandings between people. This guideline is especially important in human-computer interactions. It implies that verbal responses should match the agent's nonverbal messages so as to avoid misunderstandings between student and agent. At present, most pedagogical agents use a neutral text-to-speech computer generated voice that lacks voice inflection making verbal messages flat and possibly unclear. Additionally, we need to examine how to generate dynamic facial expressions that vary with the agents' verbal messages. An important obstacle that still needs to be overcome is the creation of algorithms that enable agents to adapt their n^{th} verbal and nonverbal messages depending on their verbal and nonverbal $n\text{-}1^{th}$ response.

Be redundant

Redundancy in effective communication implies sending the same message more than once and using more than one channel of communication to convey a message. For example, when a student is attempting to explain to another student why he felt cheated while they were playing chess, he could use a chess board to re-enact the conflict of interest. The same guideline extends to human-computer interactions. Pedagogical agents can utilize a database of images to present information and explanations to learners such that student understanding can be advanced.

Ask for feedback

Students should ask for feedback of how the receiver perceives, understands, and interprets their messages. Feedback can therefore facilitate a conversation because misunderstandings can be prevented. In the same way, pedagogical agents can ask for feedback concerning the response s(he) has given to a learner. This feedback can serve two purposes: First, the computer can log the user's response and designers can modify the agent database according to such feedback, and second, the agent can adapt his/her response according to how the message was received from the learner. The challenge with this guideline lays on the fact that artificial intelligence engines need to evolve beyond the pattern and keyword matching approach and scripted response algorithms to sophisticated evolutionary models of interaction where meaningful responses are formed dynamically and intuitively. In educational technology for example, researchers have expressed their dissatisfaction with the current state of artificial intelligence (Gulz, 2004) and noted the difficulties of exploring advanced conversational techniques in student-agent interactions.

Make the message appropriate to the receiver's frame of reference

The same information should be explained differently to students of differing levels of expertise. For example, relativity theory should be explained differently to 3rd graders than to college sophomores because they have a different frame of reference and knowledge. This guideline implies that agents should be able to dynamically alter their responses and information depending on who they are interacting with. Previous research has shown that novices understand and perceive information differently than experts, and this understanding should be taken into conideration when designing pedagogical agents.

Describe your feelings by name, action, or figure of speech

Johnson and Johnson (2006) note that it is important that descriptions of feelings should be clear and unambiguous. To this end, they suggest that feelings could be described by name (I am happy), action (I feel like smiling) or by figure of thing (I am flying with joy). In the same way, I recommend that agents should be descriptive about their "feelings" when interacting with learners. For example, agents can congratulate learners when they complete a task by unambiguously stating, "I am happy that you completed module 8 on nuclear thermodynamics."

Describe other's behavior without evaluating or interpreting

When students are attempting to resolve conflicts it is important that their comments are descriptive rather than evaluative. For example, it would be preferable for a student to say "You stood in front of me in line" rather than saying "You were self-centered by taking my place in line." In the same way, pedagogical agents should not make descriptive rather than evaluative comments. For example, consider the case were a learner spends 10 minutes on a module and only scores 8/20. The agent can give the following descriptive feedback: "You scored 8/20 by spending 10 minutes on the module. Spending more time on this material will help in raising your score." An evaluative feedback would sound more judgmental and it could be similar to the following: "You only spend 10 minutes on this module and scored 8/20. You can raise your score next time by spending just a little bit more time on the task!"

Conclusion

The design framework we presented in this paper can be used to investigate, research, and enhance the interactional capabilities of pedagogical agents. To date, ongoing research completed as part of our research agenda indicates that the framework proposed within this paper is an effective first step into a well-rounded approach to enhancing learner-agent interactions.

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Collaborative and Sustainable Instructional Design Model for Service Learning

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Abstract

Service Learning (SL), in which students learn content while performing service in their community, has been used increasingly in K-12 and university contexts (Seitsinger, 2005). Service or Learning often dominates "SL courses" due to lack of effective front-end analysis and ongoing communication between stakeholders. We created a new instructional design model to encourage designers of SL courses to link community needs to learning needs and develop communication supports to balance and sustain SL projects.

Introduction

Gagné, Briggs and Wager (1988) defined instruction as "a deliberately arranged set of external events designed to support internal learning processes" (p. 11), and noted that the first step in the design of instruction is the definition of intended learning outcomes in terms of measurable objectives. But what happens when traditional, performance-based learning outcomes are not the only intended outcomes of instruction? In this paper we describe a new instructional design model that guides designers to consider two sets of needs (and thus outcomes)–Learning and Community–when designing Service Learning courses.

Service Learning: A Definition

Service Learning is a pedagogical approach in which students complete projects that render service to specific communities in order to meet learning needs (Billig, 2002). Service Learning has been used increasingly in university (Buchanan, Baldwin, & Rudisill, 2002; Leh, 2005) and K-12 (Skinner & Chapman, 2000) settings in large part because it is said to produce social gains such as increased self-confidence and desire to be involved in the community (Billig; Manley, Buffa, Dube & Reed, 2006; Skinner & Chapman) and academic gains such as higher grades and scores on standardized tests (Billig).

Service Learning is distinguishable from community service because its projects benefit equally students and the communities the projects serve. Service Learning is widely used in teacher education programs, where pre-service teachers often mentor and tutor children and adolescents at local schools (Buchanan et al., 2002; Ryan & Callahan, 2002). Service Learning is also used to help students learn about history; in one such project, college students worked with high school students to research historically important but largely forgotten neighborhoods and take oral histories from residents (Manley et al., 2006). In each case, both communities (K-12 students) and students (pre-service teachers or other college students) benefited from the project. Pre-service teachers honed teaching techniques while helping K-12 students learn and grow (Buchanan et al.; Ryan & Callahan). History students improved their historical record taking abilities while also being able to help K-12 students understand an important slice of history (Manley et al.).

Why a New Model?

Designing Service Learning courses is fundamentally different from designing other courses because, in designing Service Learning courses, two sets of needs must be considered: community needs and learning needs. In order to avoid creating a Service learning course (where service dominates learning) or a service Learning course (where learning dominates service), it is important to consider both sets of needs at the same time in the design process (Tholecken, Clark, & Tschirch, 2004). For the seasoned designer, this may not be a challenge, as experienced designers do not follow instructional design models religiously (Gustafson, 2002). However, most designers of Service Learning courses are professors and teachers in various content areas, and are not seasoned instructional designers or experienced designers of Service Learning courses (Billig, 2002). When presented the challenge of designing a Service Learning course for the first time, designers of Service Learning courses may look to instructional design models for guidance. Opening up the typical instructional systems design model they would notice the first step towards designing their course is needs assessment and analysis (Gustafson & Branch, 2002; Kaufman & Thiagarajan, 1987). They would learn that needs assessment is identifying the gaps between what students are able to do, and what they should be able to do, and that needs analysis is determining which of the gaps can be addressed through instruction. They would also learn how to perform these steps. However, this newfound knowledge would not necessarily help designers of Service Learning courses design courses that balance Learning and Community needs because there is no provision in existing instructional design models for considering community service needs during needs analysis (Gustafson & Branch; Kaufman & Thigarajan).

Purpose of this Paper

Instructional design (ID) models provide guidance for designing and developing instructional materials and/or units. Existing ID models do not provide sufficient guidance for designing Service Learning courses primarily because two sets of needs should drive Service Learning course design: learning and community needs. Based on our experience designing and developing Service Learning courses, we created the **C**ollaborative and **S**ustainable **I**nstructional **D**esign model for **S**ervice **L**earning (CSIDSL) to help designers design and develop Service Learning courses while keeping the two complementary sets of needs (learning and community) in mind and involving community and students in the design process to promote effective communication and sustainability.

Guiding Assumptions in Development of the Model

Several assumptions guided our development of the CSIDSL model. Unique characteristics of the model along with the corresponding assumptions are outlined in Table 1.

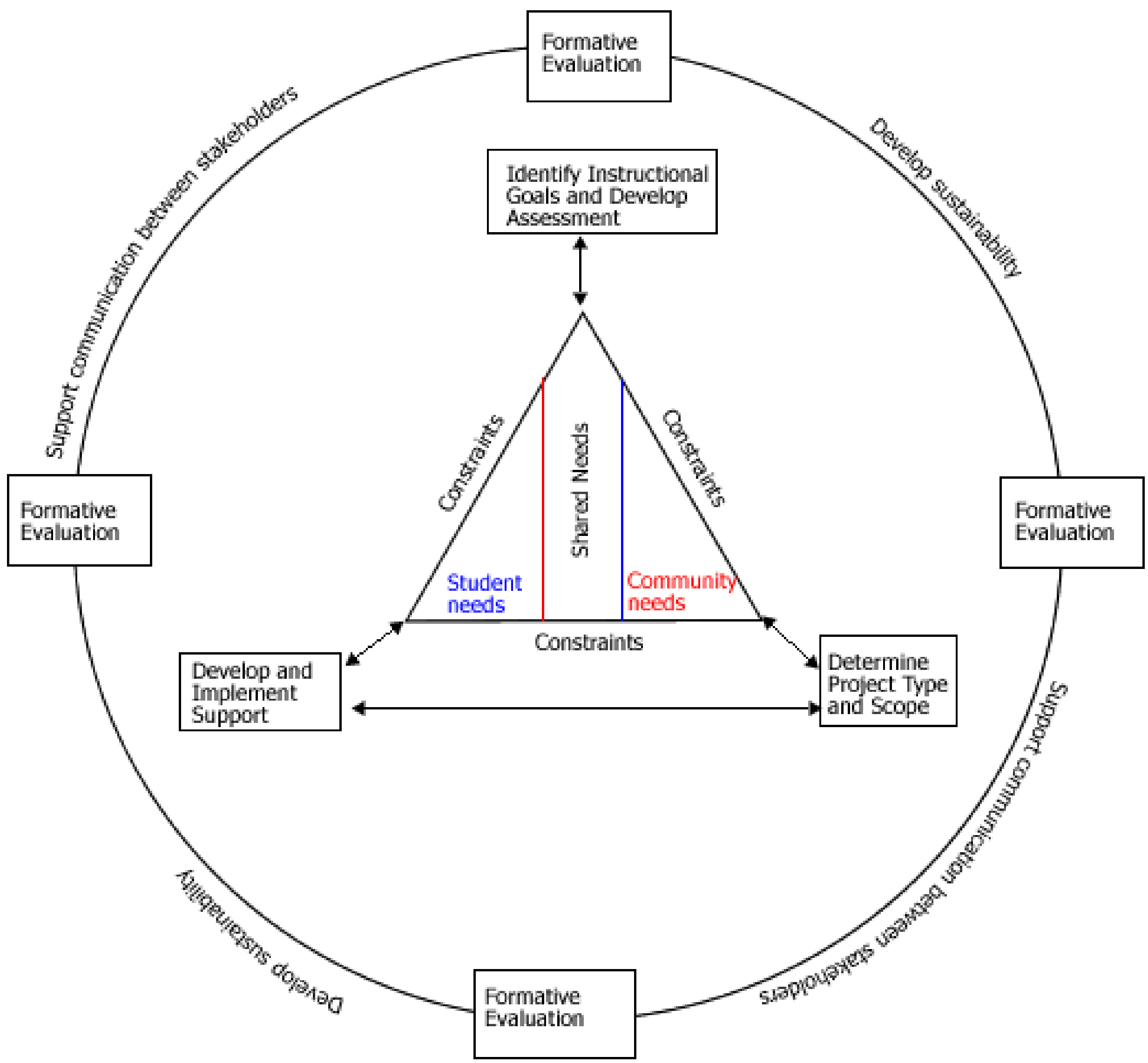
Table 1
Guiding Assumptions and Characteristics of CSIDSL

Characteristic	Guiding Assumptions
Collaborative	Students who participate in a Service Learning project's design will feel a stake and be motivated to excel in the project (Billig, 2002; Swan, 2006; Werner, Voce, Openshaw, & Simons, 2002)
	Community stakeholders who participate in a Service Learning project's design will be more likely to actively participate in the project (Yoder, 2006)
Sustainable	Service Learning courses are difficult and time-consuming to design (O'Quin, Bulot, & Johnson, 2005); thus, it makes sense to develop long-term relationships with community agencies so that one term's Service Learning project can be either continued or built upon in the following term (Yoder, 2006)
Community/Learning Needs Analysis	Designers must consider community and learning needs throughout the design process so as not to let service or learning dominate Service Learning (Burns, 1998; Manley et al., 2006)
Continuous improvement	Because Service Learning projects involve multiple stakeholders and run for many weeks, all formative evaluation and revision of instructional material cannot be accomplished before the start of the course. Therefore, formative evaluation should be performed during the term, and revision should either be performed during the term if possible, or after term end to prepare for the next term.

The Model

CSIDSL consists of five iterative stages:

Figure 1. CIDSL.



Designers must start at the center triangle, and then can proceed to other stages. In the following section we provide a brief description and illustration of how to perform each stage.

Define Community Needs, Student Needs, and Constraints

In order to design a project that meets both student and community needs, it is necessary to first know each set of needs. In this stage, designers identify student needs. Then they must specify a community agency to serve, and define its needs. For example, if a group of preservice teachers needs to learn a new reading instruction technique, an appropriate community may be kindergartners. Once an appropriate community is found, a participating agency, such as a specific kindergarten, can be identified. Shared needs (illustrated by the overlap between student needs and community needs) are tasks or knowledge students need to learn but the community agency needs to have done.

The designer must first establish the learning needs. If the Service Learning course to be developed is a graduate course in Department X, a good starting point is to interview students in Department X to see what learning needs they have that are not being met by the current curriculum. The learning needs the dictate a body of possible community agencies to serve. Because not all community agencies may be able and willing to be involved in a Service Learning project, selecting a cooperating community agency will involve communicating with the different agencies to determine a best fit. After establishing an appropriate community agency to serve, a designer must contact the agency to explore where its needs may overlap with the learning needs. Pretests and interviews can help designers identify constraints, or factors that limit designers' ability to fully address all shared needs, such as amount of time available and students' existing competency.

Identify Instructional Goals and Design Assessment

Instructional goals in the context of a Service Learning course are no different from instructional goals in the context of other types of instruction: they remain what the instruction should help students learn. For example, if preservice teachers needed to know how to use brand X reading instruction and brand Y algebra instruction methods, and the community (i.e., kindergartners) needed to learn to read, then the instructional goal should be based off the shared need: reading instruction. The resulting instructional goal would be that students be able to use the brand X reading instruction method to teach kindergartners to read.

Assessment should serve to measure the extent to which students meet the unit's instructional goals. Most service-learning courses include both content (e.g., students will be able to apply X principle in Y situations) and affective (e.g., students will choose to become involved in the community in their chosen field) instructional goals. One type of assessment that can measure students' attainment of both such goal types is guided reflection, in which students are given prompts to write reflections about their experiences both during and at the end of the project (Hatcher & Bringle, 1997; Yoder, 2006). In such experiences, students can articulate both what they accomplished and how the experience impacted their beliefs.

Shared needs dictate instructional goals. When creating instructional goals, designers should be careful to describe what learners will be able to do at the end of the Service Learning course. Designers should create measurements that assess both affective and content instructional objectives through student reflection on their experiences during the service-learning project. Such a measurement would include prompts that guide students to consider not only what they did during the unit and how well they did it, but also the impact of the project on the community (Hatcher & Bringle, 1997).

Determine Project Type, Scope, and Sustainability

The largest student participation in the design process takes place in this stage, as students work with instructors to select a motivating project. When determining project type and scope, designers should also consider sustainability, or the extent to which a Service Learning project can be sustained beyond the current semester's course.

Instructional goals, sustainability considerations, and student interests dictate project type. Project scope is determined by constraints, such as students' existing competencies or amount of time available. For example, the community agency may need an attractive web site, but if students in a web design class have no prior knowledge of Flash, and the unit lasts one week, then constraints dictate that a WYSIWYG web design program (e.g., Microsoft FrontPage) be used in the community service project. Given the large time investment in the creation of a Service Learning course, the sustainability of a Service Learning project in future semesters should also drive the determination of project type and scope.

Develop and Implement Support

Constraints help designers flag tasks that should be supported. For example, student communication with the partnering community agency, while essential to the success of a Service Learning project, can be difficult, especially when the agency and the school are in different communities. Project management can also be challenging for students. In order to ensure the success of the Service Learning project, designers must support these and other activities.

Designers can develop scaffolds that support students' time management, communication with the cooperating community agency, and task performance (Wood, Bruner, & Ross, 1976). To help ensure sustainability of the Service Learning project and ease of communication among students and community agencies, many of these scaffolds can be part of a computer-based system into which students can type such information as results of research and design specifications, and to which the instructor, other members of the student team, and partnering community agencies would have access (Kyza & Edelson, 2005).

Formative Evaluation

At each stage, designers should conduct formative evaluation to ensure that (a) shared needs are being met, (b) service does not dominate learning (and vice versa), and (c) communication channels are optimized for the success and sustainability of the project.

Designers can conduct expert reviews of both content and design, but the traditional steps of one-on-one and small group evaluations may not work optimally with instruction developed using the CSIDSL. For example, having one or more students go through the instruction may not help determine whether service is dominated by learning, or if communication channels are optimized. So formative evaluation in this model should consist of expert reviews, and then ongoing assessment during the course of the success of design strategies. While computer-based scaffolding could not be changed easily in the middle of the semester to improve communication for that semester's Service Learning course, the information gained could be used to improve communication during subsequent semesters.

Conclusion

Service Learning is one way to help students learn important content (e.g., local history and history research methods) and practice skills (e.g., teaching) in authentic contexts such as local neighborhoods (Manley et al., 2006) and K-12 schools (Buchanan et al., 2002; Ryan & Callahan, 2002). Furthermore, Service Learning has been shown to produce social benefits such as greater confidence and desire to serve (Billig, 2002; Manley et al.; Skinner & Chapman, 2000), as well as academic benefits such as higher grades and test scores (Billig). However, it has traditionally been challenging to design Service Learning projects, especially to the novice designers who often are responsible for designing such projects. Through the use of CSIDSL, designers can let the confluence of community and student needs drive instructional goals. In this ID model, both students and community agencies participate in the development of the Service Learning course, and in that way, can feel that they have a personal stake in, and be motivated to successfully complete, the project.

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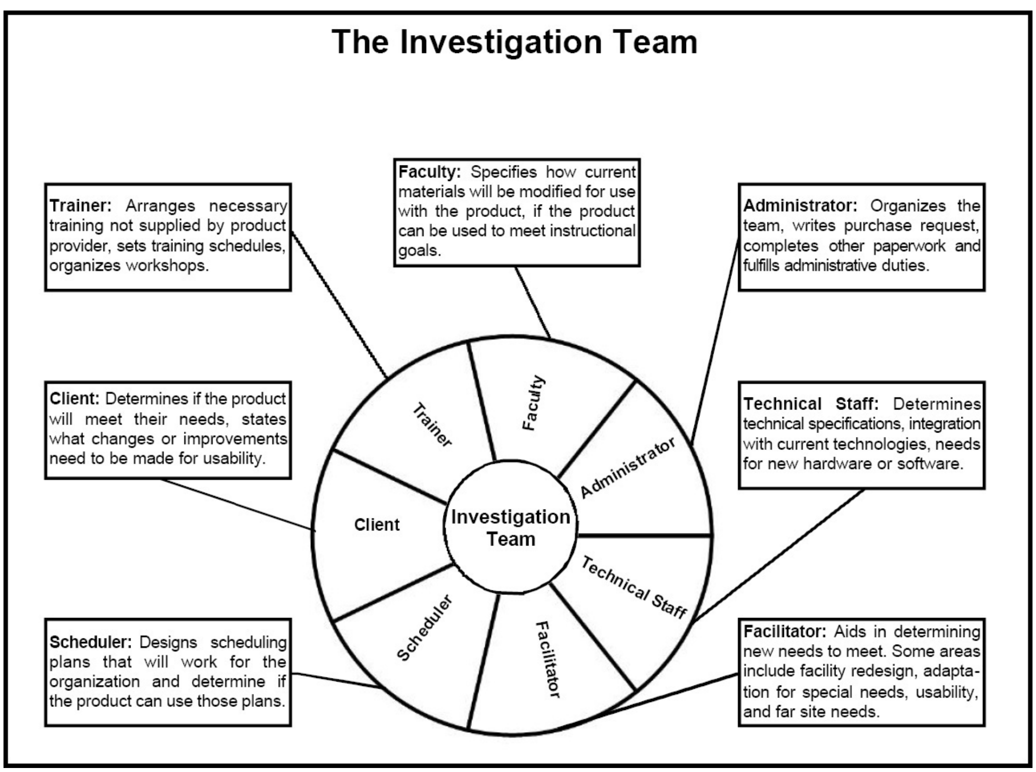
Choosing a Webconferencing Platform

Richard A. Berg

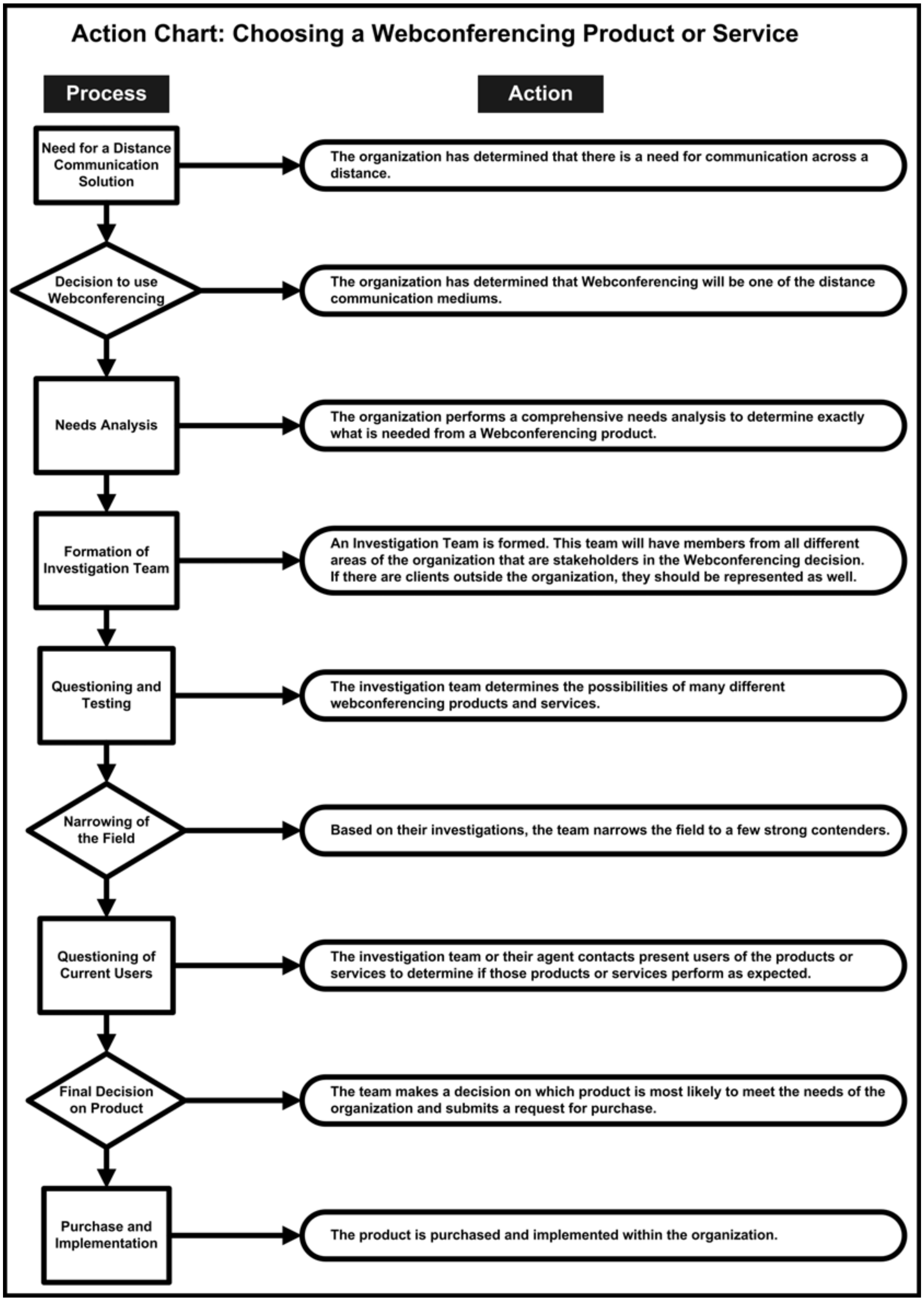
As travel budgets shrink and the need for distance education opportunities rise, Webconferencing has become a popular way for organizations to hold meetings, disseminate information, and deliver instruction. However, with over 100 different products and service providers available (Woolley 2007), choosing the right product or service to meet your needs can be a daunting task. Products and services can be almost free or cost thousands of dollars monthly. Simpler products may include the transmission of text or still images while more elaborate systems will offer video and voice over IP, text chat, whiteboards, slides with transitions, live software demonstrations and a host of other possibilities. Webconferencing can be and is being used for the delivery of university courses, holding meetings, training, seminars and collaboration at a distance. The benefits provided by webconferencing include reduced travel cost and risk, greater presence or availability of instruction, decreased need for special equipment (in most cases), and reduced out of office time. A single university professor teaching via webconferencing may be able to reach students at several remote campuses without the need to leave his or her "home" campus. A county agent being trained on the use of a new database may be trained via webconferencing without the need to ever leave their office. This decreases the costs, risks and hassles of travel while increasing the availability of the agent to his or her local clientele. The purpose of this article is not to recommend one product or service, but rather to provide assistance that may be useful in determining which product or service will best meet your particular needs.

Beginning the Evaluation Process

Purchasing a product or service should not be a one-person operation. You will want to assemble an investigation team that includes representation of all components of your organization that will have some dealing with Webconferencing before and after it is implemented. These people should include clients, faculty members, trainers, facilitators, schedulers, technical and support staff, and administrators. While it may be difficult to coordinate this team, doing so will pay off in the long run. Depending on your organization's rules and procedures for large purchases, some of these things may already be a part of your pre-purchase procedures.



Before your team contacts a sales representative, a thorough needs analysis should be done to determine exactly what your organization requires. This may be the delivery of instruction, holding meetings, disseminating information, or a combination of these. Depending on your organization, there may also be other needs for communicating at a distance. If possible, try to look down the road to see if there are any new needs that may arise. After completing the needs analysis, you will be ready to begin asking some questions.



Once your investigation team has been formed, you can begin exploring different areas that will determine your decision. The areas and questions that this article explores are not all-inclusive. If there are special needs or areas that are unique to your organization, you should include them as part of your investigation phase.

Some products and services allow free testing and in-house or online demos of what they have to offer. If possible, have your team attend a demo, or otherwise obtain a free look at the product to see if it will meet any initial needs that were identified in your needs analysis. If a free demo is provided, don't be afraid to ask questions.

As with any other technology field, there are many competitive products. Research may indicate whether a company is gaining or losing market shares, faltering financially, or about to be bought by another company. Products and services from companies that are unstable or are falling in the market may have a very short life span.

Features and Product Issues

As the number of products and services grows, the number of capabilities for session leaders also increases. Some common features are markup tools, whiteboards, chat, text questions, polls, and application sharing. The tools that are available to session leaders should be a good match to what they need to do as part of their sessions. They should also be intuitive and easy to use.

If session leaders need to have collaborative interaction with attendees, there should also be some ability for the leaders to share their tools with attendees or otherwise allow them to have some kind of control or input in the session. Some products give the session host the ability to "promote" and "demote" session attendees so that they have almost all the same abilities as the session host. Other products and services will give the session host the ability to share control of one or more tools with attendees.

The transmission of voice and video through the Webconferencing medium is increasing in popularity. There are risks and problems associated with this, however. For the transmission of voice and/or video, users must have a large amount of bandwidth available and have a high connection speed. Users on a network with low bandwidth and/or with a low connection speed are likely to experience low quality at best and, in some cases, the delay, dropping, or freezing of voice and video feeds. Another area of concern is whether the audio transmission is full-duplex or half-duplex. If the audio transmission is full-duplex, everyone in a session should be able to speak and hear one another at the same time. If the audio is half-duplex, everyone in the session will not be able to speak and hear one another at the same time. Half-duplex is somewhat akin to speaking on walkie-talkies, where only one person can speak at a time. The investigation team should determine whether or not potential users will have the available bandwidth and connection speeds to actually use voice and video features without problems. The team should also use the needs analysis to determine if the usefulness of voice or video over IP outweighs the problems associated with the additional loads on bandwidth. For example, the use of voice and video over IP for the simple purpose of providing a "talking head" is a very poor use of technology.

If there is to be two-way transmission of voice or video, the costs of equipping attendees with microphones, speakers and cameras will enter into the decision. In some organizations, it may not be possible to equip attendees with the necessary hardware to obtain the full benefit of attending a session. If there is to be a large portion of the session information delivered via live video or audio, there will also be a question of whether or not the session will still be accessible to persons with special needs.

Further, it is important to determine whether or not there are additional charges for the use of video or voice over IP. Also, ask if the product or service provides or requires a telephone bridge or other audio service in addition to, or instead of voice over IP.

In some cases, someone may miss a Webconferencing session or may want to review the proceedings. A good product or service will usually provide some way to record the session. If recording is available, it is also important to determine what options are available with the recording. Different options would include, whether or not all screens and annotations are shown in the recording, if audio is included and synched with the video, what format the recording is saved in, and whether or not it can be viewed on the Web or downloaded.

Product Comparison

Product	Minimum Connection Speed	Whiteboard	Markup Tools	Chat/Text Messaging	Polling/ Survey	Desktop/ Application Sharing	Tool/ Control Sharing	Voice over IP	Video over IP	Archiving/ Recording
WebEx Meeting Center	56K	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adobe Acrobat Connect	Broadband	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Microsoft Office Live Meeting	56K	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Elluminate Live Academic Edition	28.8K	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wimba Live Classroom	56K	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

These randomly chosen products all have similar features, but vary in their pricing and pricing structures.
WebEx Meeting Center (http://www.webex.com/smb/web-meeting-center.html) offers two different monthly subscription options and a pay per use option. A live demo and 14-day free trial are available.
Adobe Acrobat Connect (http://www.adobe.com/products/connect/) offers monthly and annual subscriptions. Free product seminars and a 15-day free trial are available.
Microsoft Office Live Meeting (http://main.livemeeting.com/) offers named user, room, shared seat, and per-minute options. A free 60-day trial is available.
Elluminate Live Academic Edition (http://www.elluminate.com/academic_edition.jsp) offers monthly and annual subscription options. A live demo and 2- week free trial are available.
Wimba Live Classroom (http://www.wimba.com/products/liveclassroom/) offers a monthly subscription. A live demo is available

Above information current on August 31, 2007. Listing of the above products does not constitute an endorsement of any of the products over one another or of any products not listed. Your investigation team should determine the product or service that will best serve your organization.

Pricing of different products will vary. Some factors that may contribute to pricing fluctuations within a particular product may include length of contract, number of licenses or hours purchased, technical support, and educational or non-profit organizational status.

A determination should also be made as to who will be in charge of recording sessions, where these recordings will be stored, and how long they will be stored. Your organization may want to have each session host be in charge of making his or her own recordings, storing them and deciding how long they will be kept. On the other hand, your organization may want to have one person or department be in charge of making the recordings for all sessions, if that is a possibility.

Implementation and Start-Up Concerns

If proprietary plugins or add-ons are required, they should be free, safe, and simple to install. On some networks, security features will prevent the plugins or add-ons from downloading or installing. There should be a Web site or other means to get copies of the plugins so that they can be installed while network security features are temporarily disabled. You should also find out if any features that are normally in place, such as internal firewalls or pop-up blockers need to be disabled or reconfigured to allow the plugins to function properly. In addition, it is important to know if the plugins or add-ons are only required for the session leaders or if they are required for everyone taking part in a session.

If your organization or your clients are using a number of different platforms (PC, Mac, etc.), or browsers (Internet Explorer, Firefox, Opera), it will be very important to find a solution that will be usable by everyone the new product or service is intended to serve. If you are able to download a free demo of the product or attend a free online demonstration, try using a number of different platform and browser configurations to spot any potential problems for your intended users. Check to see if the product or service provider has a Web page that lists operating system and browser requirements for use, as some products may require the use of a specific browser, operating system, or combination of browser and operating system.

Some products and services require a high-speed connection, while others are designed to be useable by hosts and attendees on a dialup connection. If your potential users are spread across different connection speeds, it will be important to find a solution that will allow all of your users to connect without having to travel to a location with a higher connection speed.

If your organization is going to host the product or service, you need to know what size and type of server it will require. Once you know that, you will also want to know how hard it will be to configure that server to use the product, how hard it will be to implement the product on that server, and how much time your IT staff will need to spend maintaining that server.

If your pool of potential users includes people with special needs, such as blindness or low vision, hearing loss or deafness, or motor impairment, it is important to know whether or not the product or service will be accessible to them. If the product or service is not readily accessible to people with special needs, it should be determined whether or not reasonable accommodations can be made to include these people, providing them with full access. The cost and difficulty of making these accommodations should also be taken into consideration.

A product or service may contain a feature that you do not want your users to have access to for one reason or another. Being able to enable or disable certain features at the administrative level should be an option that is provided. In other cases, you may want to have a feature added that is not currently available. Find out if that feature is planned for a future release or if the product or service provider is willing to add that feature for you. If the product or service provider says "yes" to this feature and you decide to choose this product or service provider, make sure that the special feature is already in place before signing a contract.

Using Webconferencing

There are a lot of products and services available that have all the possible bells and whistles that anyone could ever want. Unfortunately, they are sometimes not very intuitive or can be cumbersome to use. Of course, "ease of use" will largely depend on how tech-savvy your intended users are. What may seem very difficult for one group of potential users may seem quite easy for another group. If your organization has potential users with a wide range of skills and abilities, you will want to make certain that the product can be used by individuals with somewhat limited skill sets.

One of the most frustrating things to new technology users is not being able to take all of their present materials and use them in a new delivery format. Find out what kinds of materials your potential users are currently employing and how easy it will be to integrate them with a new product or service.

If most people in the organization are new to Webconferencing, there is a good chance that there will be a need for post-purchase support, both for users and tech staff. The investigation team should determine what kinds of post-purchase support are available, such as training for initial users, phone and email support, and technical support. Different products and services will vary on these issues and also on whether or not they charge for these services.

If the vendor does not provide training for users, the organization may need to provide a trainer that will help users learn how to use the product. It will be helpful if that trainer also has some knowledge of instructional design to assist users who are unaccustomed to this delivery medium.

Pricing Structures, Session Types, and Scheduling

The intended use of the product or service will have an effect on what type of pricing structure is chosen. There are three basic pricing structures. These are the seat license, the charge per minute, and the room.

- A seat license pricing structure usually is a monthly or yearly charge that allows one connection to a conference. This price is charged automatically, no matter how much or how little that seat is actually used. It usually also allows for simultaneous meetings. For example, an organization with 100 seat licenses might have two different meetings at the same time, each using 50 seat licenses.

- The price per minute is the structure most often used by Webconferencing service providers. This price per minute is charged only when the service is actually used. If the service is not being used often, and only by a small number of users, the cost will be lower than if it is being used often by a large number of users.
- The room charge or flat-rate usually allows unlimited use by a pre-specified number of users, and is charged on a monthly or yearly basis. This room, however, cannot usually be divided into smaller rooms, so the chance for different simultaneous meetings is somewhat limited.

Before choosing, be certain to know all the limitations and exclusions that apply to the particular pricing structure, and what it costs to expand the service so that a larger number of users can be accommodated. As competition in the field grows, there are also more pricing structures being developed, so check to see if the provider has other pricing plans that may be more accommodating to your organization's needs.

Scheduling and setting up meetings varies greatly among different products and services. The investigation team should find out how easy it is to schedule and set up a meeting. In some cases, a person may need to be hired to take care of all the scheduling and setup of sessions, especially if there will be a large number of different sessions occurring simultaneously. In some organizations, users set up their own sessions, while in others everyone has to go through a scheduler. It will be important that the scheduling features can be set up to meet your organization's needs.

Some products and services allow sessions to be set up in advance, while others offer "instant" sessions. Some products and services have both possibilities. The investigation team should determine which session type most fits the needs of the organization. The team should also find out if one of the options can be disabled if both options are offered. For example, an organization may only want the ability for sessions to be set up in advance and not instantly.

There are many different options for meeting entry and meeting security, depending on the product or service that is used.

- The most basic type of session entry is one that allows the attendees to simply go to a URL and automatically become part of the session.
- Another type allows the attendees to go to a URL, but they must obtain permission from the session leader to enter the session area. If the session leader does not grant permission, the attendee will not be allowed to enter.
- Still another type has the attendee go to a URL and then enter a generic session ID and/or password to enter the session.
- The most complex session entry type requires the scheduler or session leader to set up the meeting and make a specific attendee list, usually by email address and password. In this type of session, attendees must provide their email address and their specific password to be allowed entry to the session.

Some products allow the session entry type to be flexible with different options, depending on the need for security, while others have only one option. The investigation team should find out what options are available and if the ability exists to disable one or more of the options. Depending on the needs of the organization, it may also be necessary to have even more security for sessions. If this is the case, find out if additional security measures can be implemented, such as IP address verification, access control lists, or other measures.

Facility, Funding, and Usage Issues

Sometimes, a Webconferencing product or service will create the need for the physical locations to be adapted in some way. This may include installing network cabling, phone lines, or other technology connections. This could also include the installation of seating, cameras, or more computers, depending on how the product will be used. If your organization has not already decided on a physical location where the Webconferencing product will be used, such as a computer lab, distance education, or conference room, a determination should be made before the final purchase. Some products or services can be used from almost any computer location connected to the Internet. Other products contain proprietary hardware that would usually require the session leader to report to a location where that hardware is stationed.

EVALUATION CHECKLIST

An Evaluation Checklist will give your team an ordered procedure to follow and ensure that things have not been overlooked in the investigation process. Depending on your organizational needs, or the size of your investigation team, this checklist may be expanded to go into greater detail for each individual step. It is highly recommended that there be an agreement about the steps in the checklist following the formation of the Investigation Team. If there are any problems or questions, they should be addressed before the team begins the questioning and testing section.

Needs Analysis	
1) A thorough needs analysis been completed.	1)___
2) The results of the needs analysis have been interpreted to give a basic idea of what is needed from a webconferencing product or service.	2)___
Formation of the Investigation Team	
3) An Investigation Team has been formed	3)___
4) The Investigation Team represent clients, faculty members, trainers, facilitators, schedulers, technical and support staff, administrators, and any other groups that will be affected by the final decision.	4)___
Questioning and Testing	
5) The team compiles a pool of possible products and services, making every effort to include all possible products and services for the initial phase of the investigation.	5)___
6) The team begins the investigation of individual products.	6
a) The team tries to determine if the companies behind the product or service are financially stable. This is done by searching the web, business and trade journals and stock tracking, if possible. Any companies that are determined to be unstable are eliminated from the pool.	a)___
b) The team investigates products and eliminates those that do not offer features that were found to be absolutely essential by the needs analysis.	b)___
c) The team attends product demos and uses free trials when possible to help determine which products or services are most likely to serve or not serve the needs of the organization as determined by the needs analysis.	c)___
d) Through the elimination process, attendance of demos, and use of free trials the field is narrowed to a small number of strong contenders that are most likely to meet all of the needs of the organization.	d)___
Questioning of Current Users	
7) The Investigation Team or their agent contacts current users to determine if the product or service performs as well as expected and if there were any unexpected problems. Any contenders that have been continually problematic for other users are eliminated from the pool.	7)___
Final Decision on Product	
8) The Investigation Team discusses the positives and negatives of the final contenders and votes to decide the final product.	8)___
9) The Investigation Team submits a request for purchase.	9)___
Purchase and Implementation	
10) The organization or its purchasing agent negotiates a purchase agreement with the product or service provider.	10)__
11) The product or service is implemented within the organization.	11)__

Once the decision has been made that a Webconferencing product or service will eventually be purchased, a course of action for securing funding must be implemented. Implementing an organization-wide Webconferencing product or service can have a very high startup cost. Cost estimates should include the costs of buying any servers, hardware, and software that may be required. In addition, estimates should also include the cost of any other services that may be required, such as an audio bridge, full-time scheduler, trainer, and the costs associated with equipping a special room for the use of Webconferencing, if necessary.

If your organization requires one, you should begin work on a purchase request or other similar document and paperwork as soon as possible. Some of this work may even be done during the investigation phase so that the purchase and implementation process will happen more rapidly.

When you have completed your needs analysis and your investigation, you should have a comprehensive idea of which products are most likely to serve the needs of your organization. When you have your choices narrowed down to a handful of possibilities, you should ask the software company or service provider for a list of their clients that you may contact to see how pleased they are with the product or service.

Here are questions that you will want to ask when contacting former clients:

- Did the product or service perform in the manner described by the sales representative?
- Was implementation more difficult than expected?
- Did this product meet the needs of your organization?
- Were there additional charges that were not anticipated?
- How difficult was it to obtain product support?
- Would you recommend this product or service to someone else?
- Since implementing this product or service, have you changed to or added an additional service of this type to your organization?

While it will not affect your final decision on what product or service to purchase, you should establish policies on etiquette, proper use, and scheduling prior to the implementation of Webconferencing. These policies must be provided to all users so that there is an understanding of what is expected of them. A list of consequences should also be included with the policies so that there can be an expectation of uniform enforcement of the policies. If sessions for one group of users are of a higher priority than sessions for a different group of users, this should be noted. There should also be a clear policy on which groups or departments within the organization take priority over other groups or departments, and why, when there is a conflict in scheduling.

Conclusion

With so many different products and service providers on the market, it can be somewhat difficult to make a decision on what will work best for your organization. Different features, pricing structures and implementation issues should be weighed carefully against one another to find a solution that will work best for your organization. The money saved with a lower initial price may be lost if the implementation is costly. Long range costs should also be taken into careful consideration if they can be foreseen. The need for continual server and hardware upgrades, equipping facilities with special equipment, and the possible need for long-term trainers, schedulers, and technical support staff might change the decision from a product or service with a lower initial cost to one with a higher initial cost that eliminates or significantly reduces the long range costs. A committed team armed with a thorough needs analysis will be able to work together to determine the positives and negatives of each possible avenue and find a Webconferencing solution that will most closely match the needs of your organization. In the end, the hard work that is put into investigating and finding the proper Webconferencing solution for your organization will pay for itself in reduced travel costs, increased productivity, and greater ease of communication and collaboration.

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Integrating Arts and Technology: Computer Games and Literacy

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This paper describes a pilot program called the Art and Technology Writing Workshop (ATWW). ATWW was based on a theory of arts integration and new literacies studies. ATWW supported youth literacy development in three ways: writing workshop, theatre arts activities, and technology experiences. The participants used writing to mediate between experiences with creative drama and role-playing and the use of the computer to create games. The goal was to learn how best to integrate these new literacies in an after school setting. The paper includes a description and analysis of the ATWW program described as an activity setting. The outcome of this collaborative, formative study has shed some light on how technological story telling tools based on games address new literacies with possible implications for other learning communities.

Introduction

The paper discusses the first iteration of the Art and Technology Writing Workshop (ATWW) in a drop in after school program. We combined writing workshop techniques with theatre arts and computer game-making technology to stimulate young people to write. Using a formative study approach (Jacob, 1992), or design experiment (Brown, 1992), we looked at how a computer-mediated instructional intervention (ATWW) could best be implemented to achieve a valued pedagogical goal in writing instruction (increasing the amount and diversity of students' independent writing). The purpose of this preliminary study was to anticipate how best to design the integrated curriculum.

Video gaming is a shared experience among many youth in the U.S. As players they learn a great deal about a bounded virtual world in order to play (Gee, 2003; Fromme, 2003). However, it is only rarely part of the discourse community in their schools, although there are recent efforts to establish its place in education. In fact, many in education are unaware of the impact that new literacies, new media and new ICT (Information and Communications Technology) are having on our culture as a whole. (Robertson, 2005). What students encounter are contextual, integrated, new literacies in the "post-typographical world " (Reinking, 1998). The term "new literacies" (Leu, Kinzer, Corio and Cammack, 2004) refers to the situatedness of literacy and its many creative forms. New literacies studies (Kress, 2003) build on multimodal communication skills and interests that students possess.

Art and Technology Writing Workshop

ATWW was a collaboration of three entities: a neighborhood community center, a non-profit writing program and this university researcher. The faith-based multipurpose neighborhood center provided programs promoting leadership development, self-sufficiency, educational support, and gang prevention programs for youth. The non-profit creative writing program has been working with Native American students in public schools. The author had been working with drama and writing in middle school, and at using electronic game engines to tell stories. We were looking at ways to combine literacy and the arts while integrating technology into the learning activity system. And, we were hoping to learn what aspects would work best in a writing classroom. The challenge is to capture the learning and creativity and focus it on valued literacy skills for the classroom.

Arts Integration Theory

Arts Integration Theory of education (AIT) is based on the idea that art underlies all the higher human functions that involve problem-solving, creativity, and invention and connects those activities to the emotional level that is so important developmentally. (Betts, 1999) Art and literacy are both productive social activities that are constructive at their core. (Vygotsky, 1978) AIT acknowledges that the child perceives information in an emotional context through an affective filter. The aesthetic response mediates between the learner and the environment. (Vygotsky, 1971) and creates a reciprocal engagement of the teacher and pupils, each having an effect on the other as art skills and confidence grow in an environment of proximal development. In this case, drama activities bring together core curriculum matter and socio-historical development. (O'Day, 2001) In an AIT learning environment, children construct their knowledge, process and organize the information and re-present in their own terms. (Betts, 2004) Ideally, ATWW would provide a framework for this activity.

Cultural Historical Activity Theory

Cultural Historical Activity Theory (CHAT) takes human activity as the basic unit of analysis. CHAT views human consciousness as emerging from object-oriented activity (Engström 2004) and emphasizes the socio-cultural aspects of learning as well as the cognitive, acknowledging the nature of the developing learner. CHAT makes it possible to investigate the mediational processes that innovative tools can bring to educational settings and takes into account the goals and motives of the learners in the context of the setting and its social aspects, focusing on interactivity of the various aspects.

From the point of view of the youth as *subjects* in this ATWW activity system, they had as an *object* their writing. They were given several new, mediating *tools* to help them become better writers. Those new tools included word processing software and the SCC program, as well as creative writing exercises and drama activities. Reading their work aloud and editing using the remix process they invented were new writing tools as well. The *outcom*e of the 10-week workshop was a body of written products, presentation experience, and perhaps a new view of themselves as writers. Looking at its *culture*, the *division of labor*, or roles available, and the *rules* that were established can describe the context in which ATWW took place.

Formative Study

Formative study and design experiments have been increasingly used show to be useful in bridging the gap between theory and practice. (Brown, 1992;Collins, 1990) In formative experiments researchers work closely with teachers to design, develop, implement, and evaluate classroom innovations. Such activities lend themselves to creative processes in learning and in software design. (The Design-Based Research Collective, 2003)

Research Questions

(1) What did the activity system look like?
(2) What factors in the activity system enhanced or inhibited ATWW's effectiveness in enhancing students' literacies in writing and technology?
(3) How can the ATWW program be more effective?
(4) What unanticipated positive or negative effects did ATWW produce?
(5) Did the activity system change as a result of ATWW?

Setting

ATWW took place at a long established neighborhood community center. Many of its programs are bilingual in Spanish. Its several small buildings housed a meeting space with a kitchen, a newly outfitted computer lab, several classrooms, a space for ballet folklorico, and a large yard for recreation. It is located near two traditional Native American communities.

The computer room was in a separate building, a converted house with a kitchen and three rooms that had been used as a clubhouse for youth. The interior was painted with solid colors and sealed windows. The eight refurbished computers were in the largest room, set up in a circle in the middle facing out under a bare light bulb. There was a printer but it didn't connect to the PC's. Each PC had word processing and Internet connections and we installed StageCast Creator2 ™ (SCC) for the workshop.

Computer Games

SCC is an affordable cross platform application for creating two-dimensional computer games. The interface is relatively simple and permits students to learn how to position and control the game characters and settings. Students are able to "look behind the curtain" at how the games are made and begin to gain control by programming the game space. A goal of ATWW was to encourage students to change their stance toward computer games from participant in a previously programmed context – as the player, to that of an actor or director controlling the movement of the characters and the camera.

Methods

This formative, naturalistic, study relied on combining participant observation and interviewing with pre- and post- surveys of perceived self-efficacy and attitude, computer artifacts and writing samples. Analysis of student writing was to be based on a rubric used in local schools to determine the new literacies present and the best practices in effecting literacy improvement. The University of Arizona's Institutional Review Board approved the informed participant consent protocol. However, the high turn over among the participants gave us little useful quantitative data, and only impressions of their writing process. Only two consent forms were returned. Only these two students are quoted. Of the seven students who were there the first night, and filled out the pre-questionnaire, only one was at the last session to fill out the post-questionnaire.

Findings

What we found to describe about this activity system is here organized according to the Activity nodes: subject, object, tool, culture, rules and roles. It was clear that the inconsistent attendance made it impossible for the program to really get off the ground. ATWW would work better with more consideration of student interest and motivation, perhaps by directly addressing reasons that a student would want to come regularly. Although, to be fair, these students had no idea what to expect and the program was quite different what had been offered before. Some students showed that they were more interested in writing when they got to recognize themselves in it and when they got to see their words acted out. This was a hoped for outcome. That the ATWW would be such a good inauguration of the computer lab and cause the administration to make adjustments so that it worked better was an unintended outcome. For these youth, in this context, each of the three integrated activities was novel. Their acceptance of new possibilities and new identities produced a change in the ATWW activity system.

Subject

The survey forms everybody filled out at the first meeting indicated that this group of nine individuals (including staff) had some shared characteristics. They liked hip-hop music (with one exception), they liked to write letters to family and friends, and they liked to make up stories. They were not the most sophisticated Internet users or cultural mavens. They mostly did not read Manga books or use the Internet for shopping. Most said they liked to draw and to act. Most of the youth, but not the instructors (or myself), said they played video games a lot. About half the group had computers at home for homework. About half seemed to be invested in school work; liking teacher praise for their writing, and writing a lot in school. And the group was split on whether a computer helped them write.

Object

The object of this activity system was writing. We took a broad view of writing to encompass multimodality in narrative construction and creativity. The youth that came were interested in writing. They acknowledged at the outset that writing was important for them in school. For the most part during ATWW they were productive in their exercises and assignments. They did automatic writing and learned how to rough out ideas for later reworking. They worked on descriptions based on the five senses and wrote about their home neighborhoods. They learned to act out stories they had written to in order to edit and create dialogue. All these activities gave them new ways to think about writing and about themselves as writers.

Tools

Students were introduced to a computer game engine called Stage Cast Creator 2 (SCC) to create simple two-dimensional computer games and multimedia presentations. Students can create a story and visualize it by constructing a graphic narrative including character, goals and obstacles. This relates directly to the creative writing process. SCC also allowed students to import graphics and create text to report research on a topic using multimedia.

Students were introduced to automatic writing exercises and learned from the experience the important of editing and revision. For example, they wrote about "Where I'm from…" Some wrote about their neighborhoods, where "sirons [sic] are like music." A young lady from southern California wrote about missing her gang and her "homies." A boy from Mexico remembered music and the "smell of burnt wires."

Students learned several drama games like "Show an Emotion" game where they had to mime an emotion in order to sit down. The youth were wary of being called on to perform in company. As the more extroverted lead the way, the boys and girls became more relaxed the group participated with ideas and enthusiasm. “They encouraged each other to try,” wrote the drama teaching artist.

Culture

Each of the weekly meetings of ATWW had a different make up as youth dropped out and new ones came to participate. The culture that was formed was loose and largely shaped by the staff with the different individuals who came. There was intensity to the workshop style that engaged most of the youth. They looked for ways that it was like school and for ways that it was like hanging out and seemed to generally decide that it was neither.

The context was friendly and supportive of students. Within this open atmosphere, the 8 or 9 students who participated off and on in ATWW were fairly engaged while there. They were productive, and able to revise their own work and constructively criticize the work of others.

There was a drop-in atmosphere that did not encourage consistent attendance at ATWW. There were issues of behavior and mutual respect in the early weeks that required explicit rule making by all concerned.

Rules

The rules were adapted from the unstated rules that were in effect during the previous after school Prevention Program. It was established that the person who was reading would get the attention of the group, that there would be no cell phone use and that people would stay on task until the breaks. During the later weeks they were negotiating rules for themselves.

Roles

Students explored various roles as writers, editors and critics of their own, their peers and other writers' work. The age range was greater than we had estimated and there was a good deal of cross-age interaction, as sometimes the younger knew more about using the computer than the older youth and could assume the role of teacher. They coached each other in reading aloud and collaborated freely in creating dialogue to match each other's story ideas. Writing in an out-of-school context seemed to allow them to approach expressing their ideas more freely.

Outcomes

It was a very productive workshop for the youth who came. They were enthusiastic writers, ready to listen to themselves and to others, and willing to revise and refine their work based on the theatre activities and the game-making goal. Since the data collection was hampered, a simple review of the Traits (Ideas, Organization, Voice, Word Choice, Fluency, and Conventions, plus Presentation) (NWREL, 2001) showed that they were learning to use language in more creative ways.

Obviously, more research is needed in order to create a syllabus that will incorporate these three elements. The ATWW will be implemented in other contexts, and with more control and attention to student motivation, we hope to learn more about how art and technology integration works in writing instruction.

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Around the World – Crossing International Boundaries

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Description

The "Around the World" project is a program that strives to promote global awareness and understanding through a combination of videoconferencing, on-line learning projects and discussions, E-mail and other classroom technologies. The main objective of this project is to have the world audience become effective and responsible contributors to problem-solving at the individual, community, national and international levels. The presentation demonstrates the use of various communication technologies in bringing the world together.

Abstract

1. Issue

At Passaic Valley High School (PVHS) a need was felt to design an international awareness program that reflects both New Jersey's Core Curriculum Content Standards and the Cross-Content workplace readiness standards. A program was to be created that met our goals of (1) enhancing the awareness, understanding and tolerance among participants for different value systems and cultures (2) encouraging and fostering student-to-student exchange and increasing opportunities for both students and teachers to experience activities focused on global awareness (3) creating effective and responsible contributors to problem solving and decision making processes at individual, community, national and international levels (4) aiding participants in exhibiting reflective attitudes toward their personal values, the values of others, and the cultural values evident in their own and other societies (5) bringing youth face-to-face to meet and to discuss world issues that affect and unite us all (7) developing and applying skills related to acquiring, organizing, evaluating and using information technology as a communication tool

2. Description of the project

Historical Background

Colin L. Powell, in a speech on International Education Week 2002 stated, "As we work to end the scourge of terrorism, let us also work to increase peace, prosperity and democracy. We can do this through international programs that promote the exchange of ideas and the sharing of experiences. These programs give us insight into other languages and cultures and in the process build long lasting relationships among people based on mutual understanding, respect and trust."

The "Around the World" project has been ongoing for the past two years. Along the way lessons have been learned and changed innovated.

People Involved
The "Around the World" project represents a unique partnership between K12, higher education, and business. The major contributors to the project are Passaic Valley High School, the Verizon Access New Jersey Portal, NJEDge.net , Montclair State University and Global Education Motivators.

Solution

The "Around the World" project brings together teachers and students from many different countries in collaborative projects that help us better understand each other and the world in which we live. Students and teachers exchange ideas and information on topics of interest through videoconferencing and an online community. The highlight of the project is the 24-hour, around the clock and around the world series of videoconferences. Students from PVHS stay in school overnight to accomplish this task. This allows for students in schools in all different time zones around the world to meet with PVHS students during the normal course of their day. PVHS prepares the students for videoconferences by assigning student "ambassadors" for each participating country. Each ambassador is required to research their assigned country in terms of its history, culture and current events. They then present this information to their classmates. Ambassadors also moderate and facilitate the videoconference with their assigned country.

Videoconferencing with each country is for an hour. Schools prepare some form of presentation for videoconference that will help other learn more about them. Students are exposed to creating videos and using Power Point as presentation tool. Participants also prepare at least five questions to ask about the other school. These video conferences also cover a wide range of topics depending on the requests of the teachers and students in each country.

Between the videoconferences, students engage in on-line discussion on the "Around the World" online community. Instructional design support and training are provided to our teachers for creating the online community. Teachers from each participating country are enrolled as leaders in that community and the students as participants. Teachers from each country post various documents and related web sites on this community. Teachers are also responsible for starting a discussion forum and mentoring it. Students can post information, make comments, and continue discussions for several weeks before and after the 24-hour "Around the World" videoconferences.

In addition, each videoconference is streamed on the Internet. This permits parents, community members, and students from other schools in the USA and around the world to view each event as it happens. The videoconferences are also archived for future educational use.

3. Outcome

The overall assessments of each year's projects indicate several important changes in student knowledge, attitudes and performance. The majority of students involved in the projects learn that the world has a much different view of them than they had anticipated. One student stated, "I learned that we (Americans) don't know nearly as much as we should about the rest of the world". A majority of them also demonstrated a change in their perspective on global issues and a better understanding of cross-cultures. One student commented, "I learned that most kids around the world are just like us". Students also tended to be more motivated to acquire knowledge about the country and culture of the students they were collaborating with in a project. An excellent example of this was demonstrated during our first 24 hour "Around the World" project. The first videoconference of the project clearly indicated that the students from other countries knew more about technology tools, came up with better presentations and in general they had a better knowledge about our culture. This fact motivated our students to use time between videoconferences to come up with better presentations, research more about the technologies available to them and find out better facts about the next country on the schedule.

4. Relevance

The "Around the World" project could be seen beneficial to K12 educators, NJEdge.net Constituent Services Representatives, NGOs and international schools and universities. This teaching and learning project encourages the integration of different Internet technologies and promotes interactivity, student collaboration, reflection and encourages a learning environment that does not end when the class session finishes.

This presentation will demonstrate to other institutions how we, as educators, can become learning mentors in a process that will require students to accept more responsibility for learning and to be more active partners in the process. The presentation will demonstrate how a local school can strategically engage in distance learning while partnering with outside resources and helping our youth become global citizens.

Conclusions

It is important to remember that the United States is such a dominant force in the world that most of our students tend to lose sight of how we appear in the eyes of the global population. News and other media also provide a distinct bias in how we see ourselves and how we are portrayed. If we are ever going to change that view, it must be through the education of our youth. Our students need to learn not just what is happening in the world, but why. More importantly this must be understood from a global, cross-cultural perspective. Our students must also gain experience in how to work cooperatively with citizens of other nations to solve world problems and to achieve world peace. Through these international projects our students are given that opportunity to truly examine who we are from a global perspective. As the students interact they gain an awareness and understanding of their counterpart's perspective on the issues. They are also able to further share and debate their ideas and views as they seek to find solutions to global problems. Students are then challenged to reexamine their views and derive new conclusions.

Processes for the Design of Web-based Anchored Lessons

Carol Brown

Introduction

Classroom teachers will use technology when there are assurances that the lessons are effective for achieving instructional goals, not plagued by multiple obstacles in the use of the technology, and when K12 students are motivated to complete the lesson assignments. The simple use of embedded hyperlinks within a word processed document can be used to design and develop anchored instruction. All that's needed is word processing software, connections to the Internet, and ideas for a community based problem scenario. Because anchored instruction originally used high interest stories with video technology, this study included multimodality anchors using links to a variety of online resources providing streaming video. Most school systems in North Carolina provide subscriptions to online video resources, thus motivation was high, for graduate students to design and develop video anchored lessons for their students in the classroom.

Review of the Literature

Anchored instruction is a category within constructivist learning environments and closely related to situated learning theory. Typically a high-interest story has imbedded anchors with information needed to solve a complex, multifaceted problem depicted in the story. Subject matter is communicated through anchored resources within a realistic story rather than lecture or textbook readings. According to Bransford (1992) and his colleagues at the Cognition and Technology Group at Vanderbilt (CTGV), anchored instruction provides an authentic setting in which students can think as expert problem solvers. Concepts and principles related to a topic are used to generate solutions rather than being stored as "inert knowledge" (p. 293). Anchored instruction was originally designed as a means to guide students in making the best use of available information. Students learn to see the relevance of information as needed for solving a particular problem (Bransford, et al., 1989) Branford and the CTGV (1990) reported the use of video-based lessons using an authentic story that would be motivational for students. The videos were used very differently than typically used in K12 classrooms. Rather than simply presenting a documentary film, CTGV videos were used to provide information within a rich storyline that would motivate students to solve problems. The motivation factor is important and facilitates the problem-solving process (Ormrod, 1999). Other studies in motivational problem solving defined the anchored lesson as one supporting a complex problem that students will consider "worth solving and that validates the learning of a set of relevant skills and concepts" (Barab & Landa, 1997, p53). Research suggests that highly motivated students are more likely to exhibit intrinsic motivation when a topic is of personal interest. When an activity is meaningful, a student is more likely to set his or her own learning goals, process information more efficiently, and engage in the activity "over the long haul" (Ormrod, p. 441). Students transfer knowledge best when the original learning occurs within contextualized learning experiences thus the importance of authenticity for both the storyline and the embedded data. Anchors with the imbedded data support several steps within the problem solving process and likely lead to reflection and metacognitive thinking (Baker & Wedman, 2000).

Based on earlier work of Bransford and the CTGV, Love (2005) designed video-based lessons that support instructional methods for preservice teachers. Case studies of elementary classroom language arts instruction is viewed by preservice teachers who use the option to review the videos as many times as needed to identify best practices for teaching language and literacy. Using complex problems situated within a small problem space, Love's anchored lessons were designed to overcome the problem with "inert knowledge" by providing cognitive apprenticeships for preservice teachers. A cognitive apprenticeship provides the opportunity for a novice (preservice teacher) to observe an expert (inservice teacher) solve problems and exhibit best practices in a real classroom setting. According to Love:

> "A vital feature of anchored instruction is the use of a macrocontext or 'complex problem space'. . . . The importance of using realistic macrocontext is paramount to the success of the problem solving. Like cognitive apprenticeships, the use of realistic, interesting macrocontext permits students and teachers to experience many of the problems, situations, tools and environments from real-world situations (p.302)".

In addition to cognitive apprenticeships, the multimodal options available through current technologies provide greater options than “Jasper” (Jasper Woodbury, available online) ever imagined. Through the use of online resources, meaning is generated in multimodal format of audio, video, hypermedia, images, and any combination of all. Unlike *Jasper,* the teacher (or designer) no longer is required to shoot original video, but has the option of multiple Internet resources from which to anchor the problem. Love identified seven important design elements within multimodal anchored instruction. These are: selection of appropriate anchors; shared expertise and discussion on the problem statement; expanded anchors to provide diverse perspective; transfer concepts from the anchors to different context; problem with anchors tied to instructional goals; additional anchors using a variety of formats; and opportunities to explore the anchors (p.303).

Current use of video for anchored instruction includes streaming video as well as downloaded clips through online resources such as “United Streaming” (www.unitedstreaming.com). Even though a subscription website, many school systems in the region of our university are finding the streaming videos useful for classroom instruction. Teachers may show the entire contents of the video or a small, pre-selected, clip that contains specific information needed to solve the problem within the anchored lesson. Similar to codes used with videodisc technology, the design of this resource, permits bookmarking of specific video clips timed from one to several minutes in length.

The potential for gaining problem solving skills that will stay with the student beyond the school setting, opportunity to engage in meaningful community based experiences, and reflective dialog are great with the use of anchored instruction. For this paper, we will report the results of the content analysis for anchored lessons that are community-based, with complex embedded data in the form of web links to html resources and/or streaming video. The technology is very simple and only requires the use of inserted links in a word processed document; however, the motivation factor was high and the quality exceptional for the graduate students who designed the lessons.

Methods

The subjects for our study are graduate students enrolled in a master's degree program for instructional technology. One required course assignment for their degree program includes the design and development of an age appropriate anchored lesson module that supports the state’s standard curriculum for K12 schools. The design of the lesson must include the use of embedded data in the form of web links to a variety of resources related to a case study within their communities or nearby region of the state. The anchored lessons that were analyzed for this study are unique in that they are developed by teachers from a wide geographic area across the state of North Carolina. All are distance education students enrolled in an Internet delivered course, thus their case studies and situated problems reflect diverse perspectives from across the state. Topics and problem scenarios that might be of interest in the rural mountain region of the state may vary greatly from interests in urban areas in the central part of the state. The anchored lessons were archived over four semesters.

Data for this study span four semesters and two years time- spring 2005, spring 2006, spring 2007, and fall 2007. Three of the four groups were enrolled independently as graduate students in the Master of Education in Instructional Technology. The students are licensed teachers, media or technology specialists working in varying grade levels and content areas. The fourth group consists of a cohort of 15 students, seeking the Master of Education in Instructional Technology. The cohort consisted entirely of classroom teachers and a technology facilitator. Cohort members are on a predetermined timeline and sequence of courses. They also have the advantage of living and working in close proximity, thus providing more peer support than in other online degree seeking students. There were no media specialists in the cohort group. In Table 1, see a summary of group characteristics by time, professional background, and variations in the design of the course in which they were enrolled.

Table 1. Group characteristics and summary of mean scores from evaluation of lessons.

Group	Eval of lesson	N	cohort y/n	Peer eval (feedback)	Instructor feedback	Reflections	Pre-Post	Geographical region
Spring 05	M=1.8	15	No	Yes	No	No	No	Across the state
Spring 06	M=1.6	19	No	Yes	No	No	No	Across the state
Spring 07	M=1.7	13	No	Yes	No	No	No	Across the state
Fall 07	M=1.8	15	Yes	No	Yes	Yes	Yes	Piedmont area of the state

The student-generated anchored lesson was assigned in one unit of study while students were enrolled in one of four semesters Spring 2005, spring 2006, spring 2007, and fall 2007. An online lecture written by the course instructor was included in the course materials. Readings from the research literature on anchored instruction, situated learning, and a review of the "Jasper Woodbury Series" provided the base knowledge needed for the graduate students to develop the assignment for the anchored lesson. Criteria for the lesson included:

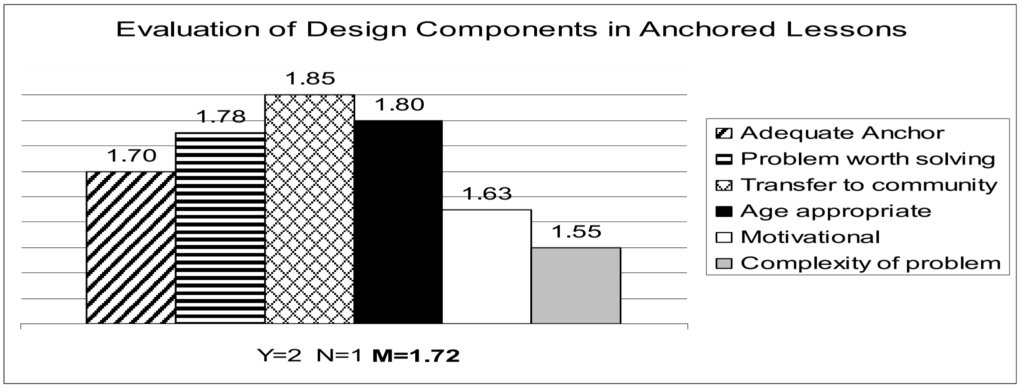
- An authentic problem scenario related to the community in which you and your students live
- Embedded links to electronic resources in the form of teacher produced documents, online web resources or streaming video pertinent to the problem scenario
- Objective(s) for the lesson that are correlated with the North Carolina Standard Course of Study
- Minimum 200-250 words in the problem scenario

Groups 1, 2, and 3 were instructed to submit their anchored lesson to an online discussion forum and participate in a peer review session through chat and discussion threads. Group 4 were instructed to deliver their anchored lesson to a group of K12 students in a nearby community; administer pre and post tests to K12 students receiving the anchored lesson, and write a personal reflection at the conclusion of the project. Groups 1, 2, and 3 submitted the final version of the anchored lesson following peer evaluations and small group discussion.
Based on the review of the literature, six main elements were identified as important for the design of effective anchored instruction. Each of the 45 lessons submitted by graduate students was reviewed for evidence of the following: Do the anchored lessons include characteristics that result in motivational problem solving experiences for K12 students? Would the problems promote transfer of learning to their community and potentially contribute to their productive involvement in the future? Are the anchors age-appropriate, providing the cognitive links that help students generate problem solutions that develop skills likely to be used in a new and different problem? Would the anchored lessons provide legitimate learning experiences that students would likely consider "worth solving"? Based on these four main elements, six criteria were established for the rubric used to evaluate each of the 45 lessons used for this study. See Table 2 for a list of criteria used to evaluate the design of the anchored lessons. Lessons were blind reviewed twice, once by the researcher and once by the instructor. Mean scores for all groups are summarized and presented in Table 3

Table 2. Rubric used to evaluate the design of anchored lessons.

Student ID	Yes = 2 points	No = 1 point		Yes = 2 points	No = 1 point
Adequate anchor			Age appropriate		
Problem worth solving			Motivational		
Transfer to community			Complexity of problem		
Means					

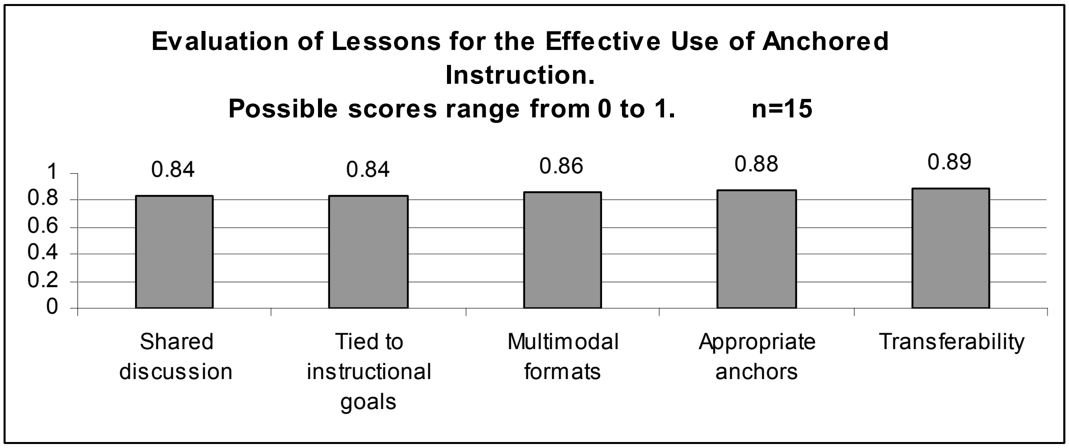
Table 3. Summary of evaluation of the design of anchored lessons over a four semester span of time.



Analysis of each lesson showed whether (or not) there was evidence of the six elements needed for effective design of anchored lessons. An evaluation of 45 lessons from Groups 1, 2, 3, and 4 resulted in a mean score of 1.70 for the criteria "Adequate Anchor". The evaluators looked for evidence related to necessary information for problem solving, within interesting and age appropriate resources. The criteria for "Problem worth solving" (1.78) were evaluated based on design of problems that were suited to the macrocontext used for the community scenario. "Transfer to community" (1.85) was an interesting criteria that linked the worthiness of the problem to the diversity of community settings. Problems included topics related to lonely elders, heavy backpacks for students, sleep deprivation of students, service in soup kitchens, bullying, character education, drunk driving, fundraising, teen pregnancy, drought in North Carolina, conflict management, and stray pets. Anchored lessons were evaluated most highly for this criterion. The lessons also were designed for age appropriate vocabulary and content of anchors (1.80). The lessons received the lowest scores for "Motivational" (1.63) characteristics, and "Complexity of the Problem" (1.55). The quality for one fourth of the lessons was evaluated at the level of textbook worksheets with dull unimaginative problems. One fourth of the lessons were designed with problems requiring only one step solutions or gathering of basic facts for a report. The problems were not representative of a complex problem requiring multifaceted steps. Many of the lessons, however, were quite excellent and did match the criteria as summarized from the literature. A sample lesson is available in Appendix I.

Group 4 submitted the final version of their anchored lesson after pre and post tests were administered and the lesson delivered to K12 students. In most instances, students worked in small groups and engaged in discussions related to the problem statement. A rubric with specific criteria matched to characteristics for anchored instruction was used to evaluate the quality of the anchored lesson. Using Love's model (2004), the rubric used for a second evaluation of Group 4 included evidence within the lesson for 1) selection of appropriate anchors, 2) opportunity for shared discussion, 3) transferability of the problem, 4) anchors tied to instructional goals, and 5) includes anchors using a variety of formats. The results of this analysis are in Table 4. Even though pre and post tests were administered to each group of K12 students, not all scores were reported. A copy of the tests was included with each lesson submitted by Group 4.

Table 4. Summary of evaluation of Group 4 for use of small groups with anchored instruction.



As can be seen in Table 4, graduate students applied a high standard of teaching methods with the design of their anchored lessons. Many of the lessons included opportunities for group discussions. All students carefully aligned the content and problems with instructional goals established by the North Carolina Standard Course of Study. A variety of appropriate resources were used and problems were effectively transferred to community settings. In particular, the video clips were selected based on authenticity for the problem and age appropriate content.

Document analyses of personal reflections were conducted. Comments typically appearing in reflections submitted by Group 4 are in Table 5. Through their reflections the students were able to think about the outcomes from pre and post tests and the effectiveness of their lessons. They were able to assess K12 students' response to the lessons. One common attribute in many of the reflections was the rich dialog students engaged in to discuss the problems, solutions, and possible products of learning that could be developed. Students even as young as 1st grade were reported to have contributed to problem solving through class discussions.

Table 5. Common Themes in Personal Reflections

Results of Pre Post Tests	Teacher Reflections
The results from a post survey suggested, not many first graders knew what recycling was but were concerned about helping our earth and wanted to do their part. None of the first graders knew that water was our most precious natural resource and that they could help save it. Most first graders answered that they leave the water running when brushing their teeth and left the lights on when leaving a room. After a group discussion and viewing of the video students were motivated to do their part and together came up with an Action Plan and an additional recycling project. After this short unit a post survey was given and all of the students knew the definition to recycling and that water was an important natural resource. All of the students answered that they would do their parts by recycling and reducing.	I really enjoyed this lesson, I believe it was more enjoyable and meaningful for the students because they had a part in it. Once introducing the problem they were motivated to come up with solutions on their own. They left feeling as though they could make a difference and I could tell this was important to them. The anchors in the lesson helped to give additional resources for the students to learn about the topic of discussion.
The students were really tuned in to the problem's presentation. They didn't realize that low test scores were such a problem. Several commented that their parents had discussed the low scores when they read an article in the local newspaper. Most of the students also admitted to never thinking much about problems that Spanish speaking students might have, until they completed the survey. These honor students discussed the fact that the only subjects shared with Spanish speaking students were electives. Some truly believed that a Spanish version of the EOC tests existed. Fifteen out of the nineteen honors students had taken or were currently enrolled in a Spanish class. This led the group into a discussion about the difficulty they had in the beginning of Spanish class when the Spanish teacher spoke nothing but Spanish for an entire class period.	The students completed their pre survey and I was able to share the problem scenario with the students along with a class discussion on the first day. On day two, I listed their reinforcement activities from the pre survey and the discussion from day one led to the addition of other activities. The honors students were really engaged in the explanation of their activities. We visited the computer lab on day three. The students experimented with Powerpoint, recorded their voice using the Audacity audio program, and searched United Streaming for an appropriate video to match their assigned unit. The last day was spent fine tuning their activity ideas and completing their post survey.

Results and Discussion

Groups 1, 2, and 3 were assigned peer reviews within small group clusters in an online (Blackboard) conferencing environment. Each teacher uploaded his or her anchored lesson to a discussion forum. Members of the small group read and evaluated the lesson. A rubric was used to guide the quality of feedback and ensure useful, reliable peer evaluation for all those involved in the discussions. Further analysis of the lessons indicated that teachers were able to design well-crafted activities with anchors imbedded within the story-problem. In Group 4, graduate students received a more in-depth online lesson with instruction in the theoretical foundations related to anchored instruction, including the history of the situated learning and the problem of "inert knowledge". The students also participated in online chat sessions with the course instructor to answer questions and clarify the meaning for anchored learning. Group 4 received instructor evaluation and opportunity to revise. Groups 1, 2, and 3 received peer evaluation and opportunity to revise. All groups received feedback using rubrics designed to evaluate the design of the anchored lesson.

Two main advantages were identified within the initial review of projects: For Groups 1, 2, and 3 teachers and specialists worked collaboratively to analyze, evaluate, and propose revisions for the final versions of their anchored lessons, and secondly, problems related to nearby community situations were highly motivational for the teachers. The online lesson included links to resources with information related to community based authentic problems as instructional method. (Kansas Association for Teachers of Science, 2004). We predicted this enthusiasm would transfer to K12 students in the classroom. Analysis of documents from Group 4 suggests that K12 students would be motivated to complete the lesson because of authenticity of the problem. Only group 4 administered pre and post tests. The purpose in adding this requirement was to gather additional data that might suggest that anchored lessons were effective for increasing student achievement. Results from the pre and post tests were reported in the reflective writings required for Group 4. For each of fifteen lessons submitted for fall 2007, teachers reported an increase in means scores between pre and post tests administered to students. A variety of tests were used, including short answer or multiple choice, essay questions, and opinion surveys. For content areas requiring recall for End of Grade tests, teachers preferred the objective paper pencil tests. For lessons related to subject such as Healthful Living, Social Studies, or Economics, teachers used opinion surveys designed to show a change in students' adoption of a particular habit or attitude related to healthy lifestyle. In addition to the tests, the anchored lessons included some type of student product such as poster, position paper, or slide presentation. This provided opportunity for peer and/or teacher feedback and dialog to discuss the problem prior to taking the post test to assess achievement of instructional goals.

A careful analysis of lessons over the four semesters shows that graduate students were able to develop lessons that include problems within a community based context and that the problems were designed to transfer to a different context for probable expanded learning by the K12 students. The design of the lessons, including problems set within a macrocontext were designed to be authentic and related to students' real-world experiences. Rubric criteria for "motivational" and "complexity of problem" received the lowest scores when evaluated by course instructors and researchers. Those rated low in motivation were designed as worksheets with problem statements similar to those found in classroom textbooks. These were not related to the local community nor set within context typically considered "real-world" for K12 students. The second area receiving a low score was in the design of the problem statement. Problem scenarios requiring one step solutions, fact based products, and simple recall for pre and post tests were evaluated at a lower score using the evaluation rubric.

Over a four semester span of time, graduate students in school library media and classroom teachers have submitted anchored lessons using simple word processed documents with embedded links to multimodal anchors that were carefully aligned with the state curriculum. Personal reflections submitted by the graduate students suggest that the lessons were interesting in design and a motivational experience during the development and delivery of the lessons. Students in the K12 classrooms responded favorably to the lessons. Evidence for this is suggested by two themes emerging from the personal reflections submitted by graduate students: First, designing and delivering the lessons was enjoyable. They also are motivated to use resources that provide specific data needed to solve problems, thus avoiding aimless wandering on the WWW. Secondly, K12 students were motivated to view the anchored videos. Each of the 15 graduate students in Group 4 reported that anchored instruction had a positive effect on their students' mastery of concepts or positive change in behaviors related to character attitudes or healthy lifestyle habits. Only one graduate student (classroom teacher) reported technical problems in the development of the anchors. The use of simple technology greatly increased the focus from obstacles in use of technology to focus on content for learning.

This report adds to the evidence already established that anchored instruction facilitates problem solving, transfers from macrocontexts to a different environment, is motivational for both teacher and students, and is best used when students have opportunity for engaged discussion related to an authentic problem.

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Appendix I.

Note: Key words within the problem statement included anchors to online resources, including video clips related to the problems.

Anchored Instruction for Problem Solving and Higher Order Thinking

Problem and Anchored Lesson Narrative:

Leon County High School has experienced an increase in their student population of limited English speaking students. The majority of these students speak Spanish. The Hispanic population makes up 23% of Leon County school system's demographics. Students who have limited English speaking and reading abilities are at a disadvantage when it comes to passing required North Carolina EOC tests, especially understanding vocabulary. If a student doesn't know the meanings of the words in the definition, how will they ever comprehend the vocabulary word? This presents a problem for the school system when EOC test scores for Leon County High School are below the state average. The tests are printed in English and some students do qualify for read-aloud by request test modification, but the tests are still read in English. Leon County High School offers sheltered classes for their LEP (Limited English Proficiency) students in English, Biology, US History, and Civics and Economics. The instructors for the sheltered classes prepare their instruction according to the SIOP (Sheltered Instruction Observational Protocol) Model. The sheltered instructors for Leon County High School attended staff development training for the SIOP Model through the SIOP Institute. Despite the progress made by the school to improve test scores, the problem of low scores still exists. Administration is working on the problem by offering LEP students sheltered classes with trained instructors. The school is continually looking for additional methods of instruction to reach the LEP students in specific content areas. Administration wants input from native English speaking students, who have experience in passing EOC tests. Your tenth grade honors class, of Civics and Economics, has been assigned the task of preparing a reinforcement activity for the "Bill of Rights and Citizenship" unit of your course. This activity should help provide assistance to the LEP students who have to take the Civics and Economics EOC. You will create a list of brainstormed ideas along with your reasoning and submit them to your instructor.

Action:

The tenth grade Civics and Economics honors class (19) was given the following survey before they were presented with the problem of low EOC scores at Leon County High School. The guided presentation was given with the use of an LCD projector and computer, so the students could experience the use of anchors and scaffolds. The Civics and Economics teacher agreed to let me work with her class for four days. We had about six hours together. Their teacher chose the "Bill of Rights and Citizenship" unit, because she felt this was a citizenship activity.

The students were given the same survey following the presentation and then were asked to create their brainstormed list of supported ideas.

Survey Questions:

Do you think EOC testing is a problem for Hispanic speaking students? If so, explain.

Do you think Hispanic speaking students get any special treatment during EOC testing? If so, what assistance do they receive?

What methods does the school use to prepare Hispanic speaking students for EOC testing?

The Hispanic speaking students take the same Civics and Economics EOC as your class does. What methods would you use to prepare those students for the Civics and Economics EOC?

Pre survey responses:

1. 100% of the responses were yes. The students felt that even if the Hispanic speaking students could understand English that they probably couldn't read it. Many Hispanic speaking students stay out of school on testing days.

2. 73% - yes They get to take the test in a separate room, where they get more time. They get to take a test written in Spanish. Someone reads the test to them in Spanish.

The Hispanic speaking students get to take the test in the computer lab, so the computer can read it to them in Spanish.

3. 27% - no The Hispanic speaking students take the test like everyone else, but fail because they don't understand it. They don't even know how important it is to pass the test.

--Have special classes the Hispanic students go to for help.

--A Spanish speaking teacher helps the Hispanic students, while they stay in the regular class.

--The teachers let students work in groups to help the Hispanic students review.

--Nothing is done to prepare the Hispanic students for testing.

flash cards for vocabulary

practice tests translated into Spanish

grouping students – one Hispanic student who speaks English with those who don't.

Hispanic students can key English words into an electronic Spanish translator or computer program.

Post survey responses:

1. 100% of the responses remained yes. Two additional responses that were added include: Hispanic speaking students probably don't have parents or siblings at home, who can help them with their school work and the Civics and Economics class is full of vocabulary. It is probably just too many words for the students to learn, especially when they may have to learn words in the definition first.

2. 90% - yes They get to test in a separate room with extra time and teacher who will read the questions in English if the students ask them to.

3. 10% - no The Hispanic speaking students have to take the test in English. They should get the chance to take it in Spanish. If they know the material, it shouldn't matter what language they show their knowledge in.

--Have special classes the Hispanic students go to for help, where teachers are specially trained to help them.

List of brainstormed ideas:

A Spanish speaking teacher helps the Hispanic students, while they stay in the regular class.

The teachers let students work in cooperative learning groups to help the Hispanic students review.

The students work in cooperative learning groups to create flash cards with vocabulary from the "Bill of Rights and Citizenship" unit. The words and definitions are printed in English and Spanish.

* A podcast could be created where students take turns reading the vocabulary words from the flash cards and their definitions. The podcast could be saved to the student resource folder on the common drive. The instructor can reserve the computer lab, so the Hispanic speaking as well as other students can listen to the podcast as they look at their flash cards. They can also use the computers in the Media center during lunch and before and after school. The instructor could save the podcast to her school wiki and the students, who have computers, could listen at home. Students could also save the podcast to MP3 Player or Ipod device.
* An electronic version of the flash cards could be created using a multimedia program such as Powerpoint. Two slides per vocabulary word could be created. One slide for the word (Spanish and English) and one slide for the definition. Students could create audio links for the words and the definitions. Images could also be added to provide additional hints. An audio link for Spanish and one for English. The definition slides could also provide links to words in the definition that Hispanic speaking students may have problems with. Again this multimedia file could be saved where students could view it individually.
* The notes for the "Bill of Rights and Citizenship" unit could be given with the use of multimedia. A combination of text (Spanish and English), images, audio (Spanish and English), and video could be used to present the information. The video could be added from United Streaming. The video would play when the students clicked on it. Questions that correspond to the video could be given to the students prior to viewing it, so they could answer the questions as they watch. They can play the video as many times as needed. The instructor may want to partner an English speaking student with a Hispanic speaking student for this activity, because the video is in English. The English speaking student could stop the video at specifics points to show their partner where the answers match the questions. United Streaming has a video called "American History: Foundations of American Government" that has a segment called "Establishing the Bill of Rights".
* A multimedia program could also be used to create a review. Multiple choice questions could be placed on separate Powerpoint slides. Each slide will also contain the 4 answer choices that correspond to the matching question. Links to match each answer choice to the correct or incorrect choice would be added. The question and answer choices could also have audio links that students could click to hear the questions and each answer choice separately. Images to provide extra hints and saving for individual student viewing can be added to this activity.

Student Response Observation and Personal Reflection:

The students were really tuned in to the problem's presentation. They didn't realize that low test scores were such a problem. Several commented that their parents had discussed the low scores when they read an article in the local newspaper. Most of the students also admitted to never thinking much about problems that Spanish speaking students might have, until they completed the survey. These honor students discussed the fact that the only subjects shared with Spanish speaking students were electives. Some truly believed that a Spanish version of the EOC tests existed. Fifteen out of the nineteen honors students had taken or were currently enrolled in a Spanish class. This led the group into a discussion about the difficulty they had in the beginning of Spanish class when the Spanish teacher spoke nothing but Spanish for an entire class period. They compared this experience to what the Spanish speaking students were experiencing everyday in all their classes. One honor student even spoke to the fact the Spanish speaking students probably couldn't receive any help with their school work at home. No one in this group knew the acronym LEP. The honors group agreed that the sheltered classes and SIOP instruction were good things the school was doing to help the Spanish speaking students. They felt like they could come up with additional activities to reinforce learning.

The students completed their pre survey and I was able to share the problem scenario with the students along with a class discussion on the first day. On day two, I listed their reinforcement activities from the pre survey and the discussion from day one led to the addition of other activities. The honors students were really engaged in the explanation of their activities. We visited the computer lab on day three. The students experimented with Powerpoint, recorded their voice using the Audacity audio program, and searched United Streaming for an appropriate video to match their assigned unit. The last day was spent fine tuning their activity ideas and completing their post survey. The students wanted to use the brainstormed list to answer number four. Another part of their discussion that was important to them was independent study. Most of the honors students felt that any student, English or non-English speaking, should have activities that could be practiced independently.

I was very pleased with the outcome of this activity. The honors students were suggesting ideas as United Streaming and the use of flash cards, which they had used in their class. All 19 students eagerly participated and wanted to create a final product for one of the SIOP classes to use. There just wasn't enough class time to do this, but I am in the process of working with the Civics teacher and LEP guidance counselor to create a technology club, citizenship group, or a combination of the two that will give interested students the opportunity to create a final product from one of the ideas. I feel that extensive work on one of these activities will only reinforce what the honors students know about the content, which will better prepare them for their EOC.

North Carolina Standard Course of Study
10^{th} Grade Social Studies Civics and Economics

Competency Goal 1	The learner will investigate the foundations of the American political system and explore basic values and principles of American democracy.
1.07	Evaluate the extent to which the Bill of Rights extended the Constitution.
Competency Goal 3	The learner will analyze how state and local government is established by the North Carolina Constitution.
3.06	Analyze how the Fourteenth Amendment extends the Bill of Rights' protection to citizens of a state.
Competency Goal 10	The learner will develop, defend, and evaluate positions on issues regarding the personal responsibilities of citizens in the American constitutional democracy.
10.01	Explain the distinction between personal and civic responsibilities and the tensions that may arise between them.
10.02	Develop, defend, and evaluate positions on issues regarding diversity in American life.
10.03	Evaluate the importance of supporting, nurturing, and educating oneself in the United States society.
10.04	Demonstrate characteristics of effective citizenship.
10.05	Describe examples of recurring public problems and issues.
10.06	Discuss the consequences and/or benefits of the freedom of economic, legal, and political choices.

Computer Technology Skills

Competency Goal 3	The learner will use a variety of technologies to access, analyze, interpret, synthesize, apply, and communicate information.
3.01	Select and use appropriate technology tools to efficiently collect, analyze, and display data.
3.03	Use electronic resources for research.
3.04	Select and use technological tools for class assignments, projects, and presentations.

Analyzing Learners' Collaborative Behaviors Using Activity Theory

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Abstract

The primary goal of the study is to analyze learner behaviors during collaborative group work in a digital learning community. A qualitative data analysis program, NVivo 2, was used to code the vast amount of online transcripts and written interviews based on the grounded theory. Resulting codes were aligned in the four subsystems of activity theory and the activation of subsystems by group work phases was investigated. Conflicting factors and facilitating factors while college students achieve a common learning goal were identified. At the same time, whether the high performing groups show patterns of learner behaviors, conflicting factors, and facilitating factors that differ from those of the low performing groups was examined.

Introduction

A digital learning community (DLC) is an emerging instructional approach that embraces the characteristics of collaborative learning and computer-mediated communication in networked environments. A DLC draws attention because it provides students with opportunities to extend their learning experiences by sharing their new ideas with, and receiving critical and constructive feedback from, community members (Palloff & Pratt, 2005). Also, learning together in a DLC provides chances for students to improve collaboration and communication skills that are required on the job (Bennett, 2005). Furthermore, teamwork is another generic skill developed in higher education (Candy, Crebert, & O'Leary, 1994). In recognizing the benefits of a DLC, the questions that come to mind are "How do learners in a DLC collaborate to achieve a common learning goal?" and "How do we need to design and support such nontraditional pedagogies of learning?"

Despite the promising benefits of collaborative learning, learners experience tensions from mixed feelings of wanting to learn independently and a fear of being isolated from the community. Dirkx and Smith (2005) argued that these negative experiences are derived from "ambivalence." A major focus of Computer-Supported Collaborative Learning (CSCL) has been providing better ways of understanding learners in communication and collaboration to achieve learning goals. Group synergy created by collaboration, however, is not fully explained by CSCL theory and still remains as abstraction (Stahl, 2006).

The direction of research has been geared toward two aspects of CSCL, that is, outcomes and processes. Research examined the effectiveness of different tools, techniques, and learner outcomes in collaborative learning. On the other hand, the process-oriented research examined socio-cultural factors and learners' language acts (Treleaven, 2004). Activity theory has been used to understand human behaviors in a social context and is one of the major theories on which CSCL is based.

This study attempted to shed light on the process of online collaboration with activity theory. The investigation revealed different patterns of learner behaviors during collaborative group work which is aligned with the framework of activity theory. In particular, both facilitating and conflicting factors were identified after analyzing the data from online transcripts and semi-structured interviews. This study also sought to determine if any differences exist between high and low performing groups for both factors in their collaboration activities.

Theoretical Background

Activity theory is a philosophical and multi-disciplinary framework to research various forms of human behaviors. It has been used as a socio-cultural analytical framework in social contexts with humans and mediators (Kuutti, 1996; Jonassen & Rohrer-Murphy, 1999). The applications of activity theory are found in learning (Hung &

Wong, 2000; Barab, Barnett, Yamagata-Lynch, Squire, & Keating, 2002; Johri, 2005; Barab, Schatz, & Scheckler, 2004), human-computer interaction (Kuutti, 1991; Nardi, 1995), instructional design (Jonassen & Rhorer-Murphy, 1999) and work practices (Engestrőm & Middleton, 1996).

The root of activity theory stems from three historical origins: classical German philosophy from Kant to Hegel, the writings of Marx and Engels, and the Soviet Russian cultural-historical psychology of Vygotsky, Leont'ev, and Luria (Engestrőm, 1987). Activity theory has evolved and reached the third generation. The first generation of activity theory stems from the idea of mediation by Vygotsky. The second generation of activity theory was derived from Leont'ev's work. He made distinctions between an automatic operation, an individual action, and a collective activity. The third generation of activity theory has expanded to include the activity system by Engestrőm (1987).

Activity theory has been further developed as a practical model of human activity, an activity system. An activity system contains six interacting components: subjects, objects, tools, rules, division of labor, and community. Activity systems are organized to achieve the goals of activities of the activity subsystems (production, exchange, distribution, and consumption subsystems) that describe functions, interactions, and relationships between the six components. The production subsystem explains how subjects transform the object of the activity system into the outcome. The exchange subsystem shows how subjects are constrained by rules and interact with the community in accordance with the rules. The distribution subsystem describes how the community defines a division of labor for the subject to accomplish the object of the activity system. Lastly, the consumption subsystem shows how the subject and the community around the subject collaborate, and also how the community consumes effort from the subject (Engestrőm, 1987; Jonassen, 2000).

Research Questions

The study intended to answer the following questions:

1. What are the different patterns of learner behaviors in a digital learning community?
2. What are the emerging conflicting factors in a digital learning community?
3. What are the emerging facilitating factors in a digital learning community?
4. How do the high performing groups differ from the low performing groups in learner behaviors, conflicting factors, and facilitating factors?

Method

Participants and Setting

In order to examine collaborators' behaviors in an online environment, we chose six groups who enrolled in a college-level class, titled 'Information Society and Education,' in the fall semester of 2006 at a large university in Seoul, Korea. Though the class met offline every week, each group of four members also worked independently online on the group project. Ranking each group according to performance, we selected three groups to form the upper half and the other three to form the lower half. Each group selected an instructional design method, submitted a project plan, and implemented an online course. At the end of the semester, each group presented the website they implemented to the class. This research used online transcripts of 24 students and semi-structured interviews of seven participants.

Procedures

The constant comparison method was used to capture real phenomena. As a result, the codes were created from the raw data. The qualitative data analysis program, NVivo 2, was used to code consistently the online transcripts from six groups for fifteen weeks. The coding scheme was divided into three main categories. The first category was learner behaviors that represented the specific behaviors performed by participants. The second category was conflicting factors and the third was facilitating factors. The codes in the learner behaviors category was then further categorized into the related subsystems (production, distribution, exchange, consumption subsystems) defined in activity theory. Upon completion of the coding scheme, the codes and the frequencies of the codes found in both the upper and lower halves were compared.

Results

First, the analysis identified 29 different types of learner behaviors. These 29 open codes generated by the grounded theory revealed seven themes of learner behaviors in a digital learning community, as shown in Figure 1. The seven themes were information seeking (i.e., share material), extraction of relevant information (i.e., summarize material), idea generation (i.e., suggest an idea, request an idea, collect ideas, ask questions), co-construction (i.e., outline tasks, suggest a meeting, suggest group work, request to do work, etc.), division of tasks (i.e., divide tasks, redistribute tasks), making or conforming to rules (i.e., suggest a rule, share template, remind of schedule, raise an issue, etc.), and evaluation (i.e., evaluate material, evaluate self or peer work). The two most frequently observed categories were information seeking and co-construction.

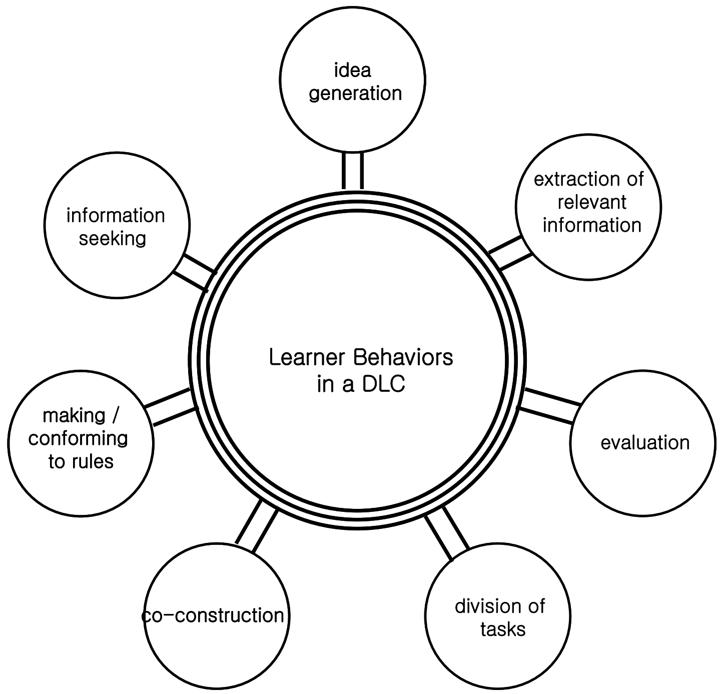

Figure 1. Emerging themes of learner behaviors in a DLC

Those 29 different learner behaviors were aligned with the four subsystems of the activity system based on activity theory. Among the four subsystems (production, consumption, distribution, and exchange subsystems) in the activity system, the consumption subsystem had eleven different behaviors (i.e., share material, suggest an idea, ask questions, etc.) and the highest frequencies of observations. The exchange subsystem had eight different behaviors (i.e., suggest a rule, remind of schedule, evaluate peer work, etc.) and the production subsystem showed five different behaviors (i.e., modifying material, submitting reports, writing meeting minutes, etc.). The production subsystem had more incidents than the exchange subsystem even if it had fewer types of behaviors. Lastly, the distribution subsystem showed one type of behavior, dividing tasks, and showed the least number of incidents. Figure 2 shows how active each subsystem is according to the project phase.

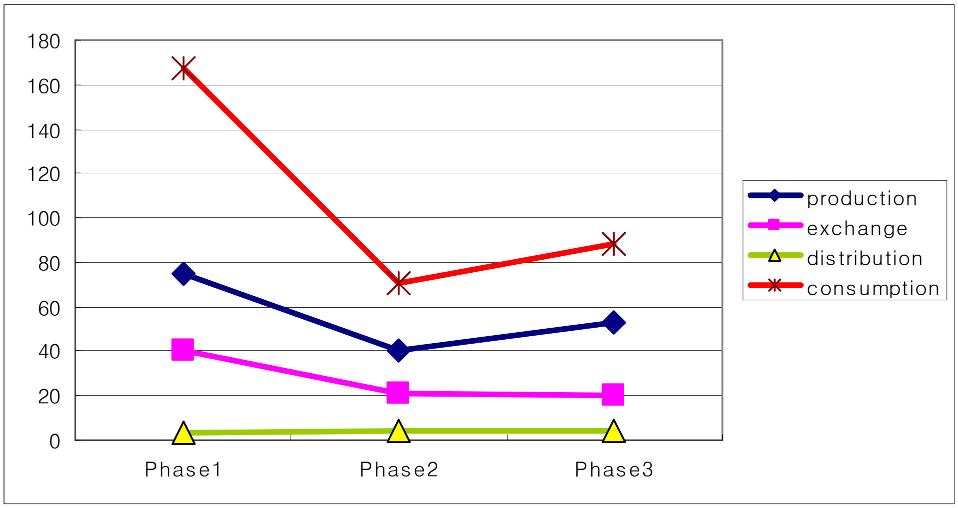

Figure 2. *Activated subsystems by group work phases*

Second, six different categories of conflicting factors emerged: inefficiency of work, unfamiliarity, difficulty in communication, issues of roles, conflicting schedules, and technical difficulties (Table 2). The factor most frequently appeared was inefficiency of work. The reasons of inefficiency included lack of skills, lack of group rules, applying inefficient methods, and lack of necessary resources. The next most frequently mentioned factor was difficulties of communication in online environment. This factor included uncertainty, nonparticipation, difficulty with relationships, and delayed feedback. Other conflicting factors included role-related issues, unfamiliarity, schedule conflicts, technical difficulties, etc. When the observed conflicting factors were matched with the components in the activity system, the most frequently observed conflicting factors resided between subjects and tools components.

Table 2
Emerged conflicting factors

Categories	Open codes	CODE	Definitions
Inefficiency of work	Lack of skills	IW_LS	Work is not performed efficiently due to a team member's lack of skills regarding tools (e.g., Photoshop, Flash) required to complete the group project
	Applying inefficient methods	IW_AI	Work is not performed efficiently due to the fact that a team member used inefficient methods to complete the group project
	Lack of resources	IW_LR	Work is not performed efficiently due to lack of resources to complete the group project
	Lack of group rules	IW_LG	Work is not performed efficiently due to the absence of rules defined by team members to complete the group project
	Difficulty with finding the relevant info	IW_DF	Work is not performed efficiently due to the fact that team members do not know how to find relevant information
Unfamiliarity	Unfamiliarity with processes or methods	UF_UP	Frustrations due to unfamiliarity with how to proceed with the group project and with what methods to use
	Unfamiliarity with topics or material	UF_TP	Frustrations due to unfamiliarity regarding the project topic or the relevant material

Difficulty in Communication	Uncertainty	DC_UN	Difficulty in communication caused by not understanding what other team members meant exactly
	Nonparticipation	DC_NO	Difficulty in communication due to the fact that a team member did not participate in a decision making process
	Difficulty with relationships	DC_DR	Difficulty in communication due to discomfort among other team members especially when there are age differences
	Delayed feedback	DC_DF	Difficulty in communication caused by the nature of asynchronicity of online communication
Issues of roles	Work delays	IR_WD	Issues of roles due to the fact that a team member does not complete one's assigned work on time
	Varying levels of contribution	IR_VC	Issues of roles due to the fact that a team member recognizes inequality of efforts made by each team member
	Issues of role assignment	IR_RA	Issues of roles due to the fact that roles were not assigned equally.
Conflicting schedules	Conflicts with other personal commitments	CS_PC	Conflicting schedules among team members due to jobs, part-time work, or other personal commitments.
	Conflicts with other subjects/exams	CS_EX	Conflicting schedules among team members due to other subjects or exams
Technical difficulties	System issues	TD_SY	Issues with sharing files due to the learning management system
	Corrupted or incompatible files	TD_FL	Issues with sharing files due to corrupted files, or incompatibilities between different versions of software, etc.

Third, the analysis revealed five facilitating factors: efficiency of work, effective communication, the competence of team members, group cohesiveness, and goal orientation (Table 3). The most frequently observed factor was group cohesiveness. This category was composed of intimacy, a sense of community, and encouraging others. When the observed facilitating factors were placed in relevant components in the activity system, the most frequently observed facilitating factors were located between subjects and community components.

Lastly, comparing the high performing groups with the low performing groups, no difference was found in terms of types of learner behaviors. One evident difference was that the high performing groups revealed about 40% more of such incidents. When the learner behavior codes were aligned in the activity system, the consumption subsystem was the most highly activated subsystem, followed by the production, exchange, and distribution subsystems, in that order. A salient difference between the high and low performing groups was that the frequency of the behaviors in the consumption subsystem was in decline at the project completion phase for the high performing groups, whereas that of the low performing groups was increasing. As for facilitating and conflicting factors, the high performing groups revealed more incidents of conflicting factors and fewer incidents of facilitating factors.

Table 3
Emerged facilitating factors

Categories	Open codes	CODE	Definitions
Efficiency of work	Applying efficient methods	EW_AE	Work is performed efficiently because team members use efficient methods to do the group project
	Conforming to rules	EW_CR	Work is performed efficiently because team members follow the rules defined by the team to do the group project
	Efficient role assignment	EW_FR	Work is performed efficiently due to efficient role assignment based on team members' strengths
Effective communication	Timely decision making	EC_DM	Team members make a decision through responsive communication
	Honesty	EC_HO	Team members talk straight regarding the way or the quality of peer work
	Proactiveness	EC_PR	Team members show eagerness or take an initiative in communication.
Competency of team members	Responsibility	CT_RE	Team members are responsible for the assigned task or the project overall
	Competency of tools	CT_CT	Team members are competent in using tools required to complete the group project
	Previous experience	CT_PE	Team members have previous experience or prior knowledge to do the group project
Group cohesiveness	Intimacy	GC_IN	Team members feel close to each other
	Sense of community	GC_SC	Team members have a sense of community, referring to the group as 'we', 'us', or 'our'
	Encouraging others	GC_EO	Team members encourage each other to keep up the good work
Goal oriented	Sense of competition	GO_SC	Team members feel a sense of competition with other teams (performance goal)
	Excellent outcomes	GO_EX	Team members strive to create excellent outcomes (mastery goal)

Discussion and Implications

This study produced a coding scheme that can be used to analyze learners' collaborative behaviors. To generate a coding scheme we have used a mixed approach that is grounded in empirical data and theory based (activity theory). The results of this study showed how production, exchange, distribution, and consumption subsystems were activated during collaborative work. Each subsystem can be considered as a learning space in a digital learning community. This study revealed that the consumption subsystem was the most highly activated subsystem throughout the project phases. DLC design should be able to support learner behaviors identified in the consumption subsystem. Likewise, when learners engage in the production subsystem, necessary tools or artifacts should be available in the DLC environment. In addition, rules govern the learner behaviors during group work. DLC designers should take into account rules that facilitate effective and productive learning. Lastly, division of labor should be designed to ensure both individual accountability and optimal interdependency among team members.

Based on the conflicting factors found in this study, some implications can be made. First, there is a need for different implementation strategies depending on the nature of conflicting factors. It was evident that some of the conflicting factors are not as harmful but can serve as an alert for interventions. The fact that the high performing groups revealed higher incidents of conflicting factors supports Engestrőm's point (2002) that development occurs when contradictions are overcome. Apparently, other types of conflicting factors are harmful and can lead to negative learning experiences or deficient learning outcomes. These include work delays, varying levels of contribution, issues of role assignments, and nonparticipation. An instructor or a facilitator should proactively monitor and intervene by using them as indicators.

Recommendations for Future Research

Based on the results of this study, the following future research is suggested. First, the findings of the study have drawn a few implications in providing an effective DLC learning environment. Those DLC design implications are required to be validated and refined through design-based research. Second, the study implied two different kinds of conflicting factors. This interpretation requires in-depth research regarding specific conflicting factors and how these factors can affect student achievement or learning processes in a DLC. Third, group cohesiveness was the most frequently observed category of facilitating factors. In this study, group cohesiveness is not directly related to group performance. Further research on group cohesiveness and performance would be beneficial. Lastly, the digital learning community in this study was formed rather involuntarily due to the nature of higher education. Future research could replicate this study in an autonomously formed learning community to determine if it reveals different patterns of learner behaviors, conflicting factors, and facilitating factors during group work.

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A "Second Life": Can this online, virtual reality world be used to increase the overall quality of learning and instruction in graduate distance learning programs?

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Introduction

Second Life is a free, online virtual reality world that has averaged over 1 million new users worldwide in each of its first three years. What is all the fuss about and what are the implications for use in education? Our presentation will involve a live demonstration of this virtual reality environment and present research whose initial findings suggest that several positive benefits are associated with its use in our graduate level distance learning program.

The immediate thought that comes to mind when one hears the words "Second Life" is a part sarcastic, part tired thought of, "I already have too much to deal with in my first life!" This is what many of us were thinking as we trooped into a presentation and demonstration of Second Life. Expecting another contribution to the social collaboration tools that are currently redefining the Web, we were greeted instead by a game-like 3D virtual reality world where users or "residents" move around and experience a digital environment with a digital-self or avatar. Several members of our faculty became intrigued with the possibilities such a free, easily accessible environment presented. We thought: could this be more than just another trivial addition to the Web?

Given the implications for increasing our online presence and providing innovative interactions and support to our sizeable distance learning student population, many of us decided to take a moment out of our busy "first lives" to take a closer look. Should my digital self be tall or short? Fat or skinny? Muscular or slim? Blond or lime green hair? Five feet or seven feet tall? Faced with such engaging decisions about usually immutable physical characteristics in a game-like environment, where decisions are immediately rendered in 3D digital images before your eyes, it did not take long for many of us to become absorbed in this new, expansive, beautifully rendered virtual world.

Second Life has garnered quite a bit of notoriety since its launch in 2003. As of February 2007 there were over 3 million residents worldwide (Retrieved February 13, 2007 from http://secondlife.com/whatis/). IBM is one of many

Fortune 500 companies investing large amounts of resources in establishing a commercial presence (Kirpatrick, 2007) and, in the academic world, seemingly every week there is a new article on the impact this virtual world is having on the real world around it. Why all of the excitement?

Present day society with its affordable computing and high bandwidth infrastructure has made great strides in catching up with providing the necessary memory, processing speed, and connectivity to experience the full effect of virtual reality technology. Second Life defines itself as, "An online society within a 3D world, where users can explore, build, socialize, and participate in their own economy" (Retrieved February 13, 2007 from www.secondlife.com). Some say that, similar to real life (referred to simply as RL in Second Life) there does not appear to be a real goal or end point and although it is initially free, to actually participate or own any land you have to pay for it (Diski, 2007). But proponents say that this environment adheres to one of the more desirable and addicting aspects of the computer gaming industry – having to figure out what to do in the first place (Wagner, 2007). In addition, virtual worlds today usually offer the opportunity to explore in an online, socially connected exchange with thousands of other simultaneous users in an "immersive environment" that is similar, yet different in many significant ways than the real world (Bixler, 2007; Dede, Clark, Ketelhut, Nelson, and Bowman, 2005).

The literature has found that the use of avatars are particularly effective when addressing motivation-related outcomes, especially as it is associated with a learner's self-efficacy or confidence that one can accomplish or learn some identified task (Park, 2007; Baylor & Kim, 2004); particularly engaging to users is the ability to manipulate an avatar's ethnicity, gender, and other physical attributes (Park, 2007), which is a major component of the Second Life experience. Educational purposes, however, focused primarily on two primary aspects of virtual reality: an immersive environment and social interactions (Bixler, 2007; Dede, Clark, Ketelhut, Nelson, and Bowman, 2005).

What was it that a graduate faculty at a mid-sized southeastern university saw in Second Life that so engaged us? One of the immediate ways of using this technology was to ask students to participate in this immersive, socially interactive environment for our distance courses, which typically are a blend of face-to-face, television, and course Web site. One course has used this environment to provide its "face-to-face" lecture in a virtual, private "sky box" that brings students from three campuses divided by real constraints of distance together into one "class room." We also began holding "virtual" office hours where students at a distance in particular expressed the desire and ability to just "drop" in to talk to a faculty member just like local students can. Second Life has also served as an ever present, free resource for students to interact with and evaluate a living example of an impressive use of multimedia technology.

A review of the relatively young body of literature on the educational impact of Second Life suggests that the primary focus has been on the multifaceted ways people are currently using it, especially in the business sector, but with no focus on learning outcomes or student attitudes, especially for non-traditional school aged students represented by graduate students. Although our research is in its preliminary stages, we have used a mixed-method approach to address two primary questions that we feel will make a significant contribution to the literature:

1. In what ways has the use of Second Life impacted learning and instruction in distance learning programs?

2. How usable is Second Life in terms of utility and general ease-of-use for students and faculty?

Data collection involved natural observation, qualitative interviews, user surveys, and content analysis of discussion board transcripts.

Method

Participants and Instrumentation

All 18 participants in the study are samples of convenience. The study's sample included three faculty members from a mid-size southeastern university graduate program that used Second Life as part of their blended (n=3) and online courses (n=1), a Second Life instructor who teaches virtual seminars, nine graduate students who participated in a course featuring Second Life as a primary mode of course interaction, and four students who attended a series of virtual seminars in Second Life (n=4). The data collection period was from January 2007 to October 2007.

Faculty (n=2). Two of the authors of this study are tenure track faculty members who teach traditional and distance graduate courses. Each documented how Second Life was used in their courses, how students reacted, and general thoughts about overall utility and potential use in distance learning.

Second Life Instructor (n=1). The Second Life Instructor teaches several virtual seminars in Second Life and asked eight of her students a set of six questions including, "How quickly did you pick up the skills necessary to be successful in the class?", "What are the positive and negative aspects of learning in a virtual environment?", and "What real life lessons and/or skills were learned from your experience in a virtual environment?" A content analysis was conducted of the four student responses that were received.

Graduate Students (n=9). Students in a face-to-face course studying online collaboration tools used, examined, and discussed Second Life and its potential use for educational purposes. A content analysis was conducted of student discussion board transcripts which took place over a one week period (January 28-February 4th, 2007).

Results

The Wow Factor

Second Life is a free to use three dimensional world that adheres to one of the paramount standards of usability which is user control or "designing a product so that the extent to which the user has control over the actions taken by the product and the state that the product is in is maximized" (Jordan, 1998). Becoming a member of Second Life is relatively easy and painless and the process and engagement involved in creating a virtual self (referred to as an avatar in Second Life) is addicting and relatively limitless.

Our program purchased virtual property within Cybrary City, an island where libraries and information resources are made available in Second Life and each of our faculty created their own avatar. A photo of the faculty virtual avatars in front of our virtual building is shown in Figure 1.

Figure 1 - Faculty Avatars and Department's Virtual Building

Presented with the ability to freely change an avatar's features, clothing, and virtual possessions, our faculty quickly embraced Second Life as a vibrant place for exploration and social collaboration with tremendous possibilities for our graduate program: Social collaboration amongst faculty and students, three dimensional information seeking both for reference and program marketing purposes, and classroom presentations and work groups in small group settings.

One of the biggest problems with attempting to conduct a class within a public building is the potential for anyone to interrupt class, which in the real world is clearly inappropriate but in the virtual world is a facet of understanding the dynamics of the SL social situation. In order to protect against this, one of our faculty members created a private virtual skybox that can only be accessed through private invitation. Figure 2 shows an avatar seated in our virtual classroom in the sky.

Figure 2 - Private virtual classroom in the sky

Faced with a blended course involving over 80 students across three campuses statewide, one of the authors of the study felt Second Life would be an ideal opportunity to build stronger collaboration between students from different campuses. The use of Second Life, however, turned out not to be that simple.

Second Life Meets Academic Reality

To enter the world of Second Life the computer you are using must have the Second Life software installed and have the computing hardware in terms of RAM, processing speed, and graphics card necessary to run this robust software. Prepared to present to the entire class from the classroom teaching station, the author realized that the software had not been preinstalled by technical support and impromptu installations were not allowed without an administrator password. The long awaited preview of Second Life had to wait a little longer.

The following week Second Life was successfully previewed in class and all students were informed that in conjunction to the author's on campus office hours, virtual office hours would also be available in Second Life. In addition, the author brought up the possibility of conducting a full class session completely in Second Life. While the feedback from students were predominately positive regarding the "wow factors" of being able to create a virtual self, fly and move freely around a three dimensional virtual world, and meet new people in a uncontrolled environment, the overall course outcomes were less favorable. No class meeting was ever held in Second Life because a small, yet significant minority of students could not access it through their older computers and when these students approached their campus academic libraries all were told that Second Life was not installed on the library computers and could not be without a strong rationale from the instructor. Due to time constraints, the author did not attempt to articulate this rationale as it would have involved engaging with three university libraries simultaneously. The author's virtual office hours also mirrored the overall usage of physical office hours, which was not utilized at all and a surprise since the availability for individual student contact had been increased by over 50% by making synchronous office hours available to the two distance sections[1]. The following semester, one of the authors decided to try again and offer virtual office hours via Second Life to an entirely online course. This attempt met a similar fate where no student took advantage of this opportunity to "drop in" to meet with the instructor during posted virtual office hours.

A second author of this study had students engage with Second Life as a focus of a class as it provided an environment rich in learning resources and an opportunity to conduct class and discussion in an online environment. Students were introduced to Second Life in a face-to-face class where they were given the opportunity to interact with the instructors and other students in making their initial foray into the alternative world of Second Life. Many of the students were apprehensive in developing their avatars and making initial contact with other participants in this environment. They came together as a class in the online environment to receive instruction and explore learning opportunities. Instructors planned and conducted a journey with the students bringing the class to specific locations and then discussing the uses of the particular "landmarks" or locations within Second Life. Students were able to bookmark landmarks for further exploration and were able to ask questions of other students and instructors as the tour progressed.

Class was also held in Second Life with mixed results. The idea of having a real time chat in the online environment was beneficial but the use of a virtual physical space may have been unnecessary for the content of the particular class. The use of PowerPoint and notes within the virtual classroom, however, added a more dynamic element to the class and made better use of the tools that Second Life offers to an instructor. The class offered an opportunity for both instructors and students to operate in a virtual environment both synchronously and asynchronously; exploring the resources and meeting with each other. Problems that arose centered on the fear of technology and the learning curve of some students but everyone in the class was able to overcome their hesitations and participate in the virtual classes with a minimum of difficulty.

Student comments varied widely in their perceptions of this first experience. All nine students found Second Life to have uniquely positive aspects for educational purposes: it connects users to a wide array of information resources, it provides "residents" with the ability to fly and transport one's avatar from one place to another, it provides a generally "stimulating," immersive, and interactive learning environment, it allows users to virtually "experience" information as opposed to just reading text, it socially connects people and organizations from different parts of the country and world "who you would probably never meet in real life," it is a cost effective way to meeting virtually as opposed to actually "face-to-face" with other people, it provides opportunities for virtual field trips and simulated experiences, and, in general, the 3D world is much more conducive to an online educational learning environment then traditional flat, one dimensional text-driven digital displays.

There were also a number of negative aspects. First and foremost, were the technical issues involving the need for robust computing and connectivity - one student reported having his computer's graphics card malfunction. In addition, students ran into the general prohibition of the use of such software[2] in public computing environments where students tried to take advantage of more robust hardware to use Second Life. Another primary point brought up was the potential of "wasting time" and challenge of "time-on-task" especially when attempting to teach a large number of students. An additional issue was that while the "uncontrolled" environment of Second Life can prove educationally stimulating at the same time it does make it a challenge to manage the learning experience and ensure

[1] The course included three sections, one face-to-face local section, and two distance sections.
[2] Second Life is not a Web site that you connect to but instead requires you download its client software directly onto the computer you are trying to connect with. This causes major issues in attempting to access Second Life in public computing environments such as public or academic libraries because most prohibit downloading of unauthorized software.

consistency in student experiences. Finally, while online collaboration can be quite enjoyable and successful at times, students brought up the concern of the coldness and artificial reality associated with technology as an explicit danger, especially when faced with the thought of entirely replacing real human interaction with a digital, virtual world.

Providing Instruction in Second Life

Two applied examples of how Second Life is currently being used for instruction are continuing education Virtual Librarianship courses offered by the University of Illinois at Urbana-Champaign and a technology course taught at San Jose State University.

The University of Illinois at Urbana-Champaign and the Illinois Alliance Library System has made use of virtual adjuncts to teach continuing education, no-credit, six week courses in Second Life. Five courses have been offered, two in the summer 2007 and three in fall 2007, with an average class size of 20-30 students per course. These classes are taught by librarians in Second Life and have covered such topics as Intermediate Virtual World Librarianship, Virtual World Librarianship in Second Life, and Libraries and Immersive Learning in 3D Virtual Environments. Table 1 below shows the general breakdown of one of these courses:

Table 1 - Virtual Course Overview

Virtual World Librarianship in Second Life Course Overview
Week One: Introduction to Libraries in Virtual Worlds
Week Two: Second Life 101
Week Three: Collections, Resources, and Exhibits in Virtual Environment
Week Four: Reference and Information Services in Virtual Worlds
Week Five: Managing and Working in a Virtual Library or Department
Week Six: Skills Needed by 21st Century Librarians in Virtual Worlds

Jeremy Kemp at San Jose State University taught a section of Information Technology Tools and Applications in summer 2007 that included bringing students into Second Life and having them work on projects with Second Life librarians to illustrate examples of how the software they were studying was being applied as well as to locate virtual resources around designing advanced Web applications using technology such as dynamic HTML and XML and Web programming languages such as XSLT, JavaScript, JSP, Perl, PHP, MYSQL, and ASP.

One of authors of this study works for Second Life as an Assistant Director/Operations Manager for the Alliance Library System's Info Island Archipeligio. As part of the study, she asked her students about Second Life. Two students worked with her on a business/tourism project called Virtual Morocco and answered her questions in Second Life. A second pair of students she worked with in a class being taught at a local university answered questions via email.

In response to the question, “How quickly did you pick up the skills necessary to be successful in the class?” all four students responded that they had easily picked up the needed skills quickly and felt confident about using Second Life within two to three weeks. The more experienced students initially were called upon to do more advanced tasks in Second life and were taught building and scripting skills, which they learned with relative ease. Students felt that the most positive aspects of learning in a virtual environment were that it was: Collaborative, asynchronous, involved visual and kinetic learning, and provided opportunities for interaction with others inside and outside of the class. The major negative aspects of learning in a virtual environment involved: Problems with technology, high end requirements, Second Life downtime for maintenance, use of traditional classroom teaching methods while in the virtual world, problems encountered from disputative Second Life residents, and learning to communicate textually requiring instantaneously formulating answers and responses and fast typing skills[3]. In terms of the most valuable lessons learned from working with Second Life the students listed the following: Time management, self reliance, leadership, teaching, social networking, graphic arts and design, experience working with virtual groups, and experience with virtual reference.

[3] Second Life has added a voice component that should help alleviate this requirement.

Discussion and Conclusion

Teaching and Learning Opportunities in Second Life

The use of Second Life in graduate education and in teaching and learning environments in general are not limited to distance learning. As a free resource that in the past would have been cost prohibitive, Second Life represents a relatively open access, immersive virtual 3D learning environment that has many potential uses in teaching and learning environments. Based on the results of our study and review of the literature, here are some of the major teaching and learning opportunities Second Life represents:

Placing an Avatar with a Name - In the past, and for the most part even today, a typical synchronous online interaction in distance education involves text-based chat. Users are defined by their user name and communicate by typing text based messages. Second Life, ironically also uses text-based chat as the primary method for communication. Changing the communication environment from a flat, text based one dimensional interface to a rich, multi-color, 3D environment that allows users to represent themselves with virtual avatars or representations of themselves. As student isolation is one of the major problems associated with distance education, the ability to "place an avatar with a name" and add the aspects of non-verbal representations of personality and feeling, has significant implications for social collaboration and communication in online environments. While sharing the major benefit of online, synchronous communication, which is to not have to meet face-to-face at a specific physical location, Second Life adds many additional layers through virtual representations of physical characteristics and communication to this online interaction.

Synchronous Virtual Information Seeking - Unlike navigating a Web site, in Second Life you have the opportunity to interact with both static information and synchronously with other users. The concept of adding a synchronous, three-dimensional aspect to online information seeking is one of the aspects of Second Life that has captured the attention of the corporate world. The same benefits apply to teaching and learning environments where students can both access digital content in Second Life while at the same time engaging in a discussion with a student or instructor. In addition, other users through their virtual avatars serve as additional resources that otherwise would not available. For example, at Cybrary Island, information science buildings from across the world are housed together ranging from the US to Europe to Asia. Interaction amongst instructors and students are frequent and, engaging in discussions around mutual topics of interest that is truly global in nature, has many possibilities.

A Virtual World Allows for Virtual Experiences and Resources - In Second Life you have the ability to perform tasks, create objects and environments, and interact with people and objects that you cannot do in real life. For example, you can fly, teleport, and generally control and customize your avatar in unlimited ways. Outside of the social consequences of being able to create a digital self, creating virtual learning environments or interacting with existing content rich ones is where Second Life excels. Although like most online instruction, planning and preparation is necessary to find relevant resources and to ensure the integrity and effectiveness of instruction, Second Life can be used as virtual field trips so that students can not only find relevant resources but also potentially have the opportunity to see and interact with 3D digital information as well as other users as information resources.

Technology as a Nexus Point - The Internet and the Web connect people and information together. Traditionally this is done through digital information usually in the form of text, graphics, video, and document/file exchanges. In distance education, television/video conferencing, Web cams and Web casts, threaded discussion boards, and synchronous chat are the predominate mediums in which collaboration is achieved in one-to-many instructor-to-student educational environments. Web conferencing software, which integrates Web video, file sharing, and synchronous chat is highly desirable in the delivery of distance education but is extremely costly and usually involves dedicated internal resources and support by the distance program. Second Life offers a potential nexus point in which distance programs can utilize this virtual world at little or no cost for its instructors and students. Social connection and collaboration in many ways is the easiest to attain in Second Life and at the same time helps meet an essential need for distance students.

Challenges of Using Second Life

Technology – Although broadband connectivity and computing power continues to become more robust and inexpensive, to operate in the vibrant digital world of Second Life takes high end computing power. This poses a significant barrier equally for instructors and students as computers that are only a couple of years old may not have a high end enough graphic card able to handle Second Life's robust graphics. With the increasing popularity of Second Life this poses a unique digital divide that previously did not exist. In addition, as Second Life requires a software client download, it is difficult to use public computers thereby severely limiting its overall portability.

Allocation of Time and Resources – Second Life is time intensive for many reasons. First, it is highly addicting because of the large number of options and overall control it provides users, especially as a user's avatar is the virtual representation of that user and therefore usually garners careful attention to such details as height, weight, hair color, skin color, general physical features, and certainly clothes. Second, learning how to operate in this virtual world, although relatively intuitive, takes some acclimation and experimentation. Third, is the time and resources it takes to create a digital instructional environment (to have personal space you must purchase virtual property), which can be substantial. Training for students must also be factored in. Fourth, is the amount of set up time and technical support required to ensure all students are successfully able to access the high end computing resources necessary to interact with Second Life. Lastly, in terms of instructional design, attempting to use standard classroom teaching methods in a digital world usually does not translate very well, especially if it is almost completely chat based. The addition of voice communication will help mitigate this problem.

Uncontrolled Learning Environments – A user's avatar is called a resident in Second Life. Unfortunately, a majority of residents are not in Second Life for educational purposes and therefore, when trying to provide instruction there is always a chance that an instructor or students will be interrupted. In addition, similar to the impact laptop driven wireless computing has in classroom settings, the opportunity for students to lose interest or become easily distracted is considerable.

Conclusion

Distance learning programs use course management systems to organize and deliver content as well as manage course functions. Second Life represents another medium in which to engage and collaborate with students or have students engage with peers. At a cursory level, this unique digital virtual world allows for more complex social interaction as it introduces personal expression through virtual avatars that bring virtual non-verbal communication and interaction. At more complex, well planned levels, Second Life becomes a vibrant learning environment where self-exploration, virtual tours, and access to a diverse set of users are easily accessible and available.

Distance learning is a great way to allow students who are scattered geographically to take advantage of a class that does not require face-to-face classroom instruction. While the technology is in place to facilitate distance learning, the actual class experiences of traditional distance learners can be less than satisfying for the student and the instructor. From the student's perspective it is more difficult to form relationships with others in the class and the instructor. While the materials may be fully covered and the assignments completed, graded and returned electronically the overall experience lacks the kind of connection students feel in a standard class. Second Life, and other virtual environments help bridge this gap by giving students the feeling of being present with other classmates and with the instructor. They have the ability to talk to each other during class in private instant messaging and to ask questions of the instructor as the questions arise naturally out of the lesson plan. Although this is still a form of electronic communication, it creates a shared experience for the students and instructor. It is difficult to explain the connection, but one of the Linden Labs employees, Pathfinder Linden, calls this connection "emotional bandwidth." It adds an element of depth that cannot be achieved in a standard distance learning situation.

Another way that Second Life and other virtual environments will impact distance learning is to enable a greater variety of classes to be taught. In a 3D environment, instructors may now demonstrate instruction as well as lecture and students may work together to create projects within the virtual world. In addition, with access to a greater number of global residents the opportunity for synergy and collaboration expands. The technology of 3D virtual worlds is being expanded and improved and many private and public organizations are creating virtual spaces that someday will be tied together much like web pages of today. These early explorations of education in Second Life will help to build a foundation for virtual education of the future.

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The Design of Collaboration in the Virtual Classroom

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Issues with Online Collaboration

Even though college-level online education has steadily been growing with a potential to promote democratization and the advancement of scholarship of teaching (Larramendy-Joerns and Leinhardt, 2006), distance education is often the weakest link in supporting problem-solving and metacognition (McLoughlin and Hollingworth, 2001). Having technology and a communication infrastructure seems not to be enough to facilitate meaningful online dialogue conducive to learning. Improving online students' engagement in course content and class community through effective design of collaboration is the focus of this paper.

Learning in online communities evolves as a succession of changing actions; it requires: (a) constant change of position in an endless variety of patterns (like in a kaleidoscope) and (b) exchange of roles between instructor and students. Online discussions are essential as a way to facilitate learning. However, research shows that students may not truly participate in online discussions. Their participation may become a superficial and a mandatory exchange of information, which betrays the learning goals behind the use of discussion forums as part of online courses.

The Design of Online Collaboration: An Exploratory Study

This study investigates the design of collaboration among students in two online courses. These were supported by the learning management and delivery system, WebCT. The goal was to analyze the design of three types of discussion formats and assess their impact on students' participation in online discussions.

Context and Participants

This study took place in a large research university in the Midwestern United States with a recognized leading program of instructional technology in teacher education (Davis, 2003). This same university offers a Masters of Education at-a-distance in Curriculum and Instructional Technology (http://ctlt.iastate.edu/~citmed/). This graduate degree program was designed to meet the needs of teachers and other educational practitioners seeking leadership positions for infusing technology into teaching and learning, who were widely spread across rural Iowa.

A total of 31 students participated in this study. Eighty percent of the students were in-service teachers and members of the first two cohorts of the Masters of Education at-a-distance. They were elementary and secondary level teachers working in several schools across the state of Iowa, and teaching a variety of topics (e.g., History, Math, Science, English, Art and Technology). The remaining students were traditional non-cohort students in the Instructional Technology graduate program. Since some of these students had full-time jobs that required a significant time commitment, these online courses were especially attractive to them.

WebCT was organized with a focus on resource sharing and discussion. Different discussion forums were created to facilitate the sharing of experiences and knowledge. In each of the online courses, students experienced three different collaboration designs. The formats were: (a) large group discussion facilitated by the instructor, (b) small group discussion facilitated by the instructor, and (c) small group discussion facilitated by peers. An anonymous course feedback discussion area was created as a way for students to offer continuous feedback on the course.

Data Collection Methods

Data were collected through analysis of discussion threads posted in the WebCT Discussion area, course materials, and responses to a 13-item questionnaire. Ten items out of the 13 were Likert-scale items based on a five-point scale from "Strongly Disagree" to "Strongly Agree." These questions addressed level of participation in the discussions, quality of the feedback from classmates, use of critical analysis skills, team members' engagement, and learning by sharing reflections. Three open-ended questions were part of the questionnaire as well. These dealt with preferred discussion formats and reasons for such preferences.

Major Findings

The analysis of data identified a series of factors related to whether the instructor and/or a peer facilitated the group and the content of the discussion forum, as well as its role in students' engagement. The following paragraphs describe the major findings of this study.

Most respondents agreed that their level of participation in the discussions were high, but they showed some indecision regarding the quality of the discussion. Most of them reported not having learned much from the large group discussion, reason why they were not involved. There were several reasons related to this situation. Students felt lost and overwhelmed in the large group discussion and they also described a low involvement because of the other numerous assignments required by the courses. Overall, students were undecided regarding advancing their critical analysis skills by participating in the discussions. Divergent responses on team members' engagement in small group discussion were found.

Most students agreed that their participation efforts in the weekly discussions (large or small group) were not extraordinary and that the level of interaction in the large group discussions was also low. Sharing reflective summaries in the group discussions was not perceived as a learning opportunity.

When asked on which discussion formats worked better for them, 62% of the students answered "small group discussion facilitated by peers." This format offered concrete questions and gave the students and option to choose the ones to answer. Interaction was higher when discussions were introduced as a topic either open-ended or related to practice. One of the respondents explained why this was his favorite discussion format: "Because I can bring my own background knowledge & make it relevant to me."

All participants stated that "large group discussion facilitated by the instructor" was the discussion formats they found less useful, meaning less conducive to class participation. Following are some of the students' comments:

- "It was not compelling & everyone answers the same thing."
- "Questions 'straight from the book' usually try to elicit a specific answer – the first couple of people who answered said what there was to say about question and the rest of the responses were tough to create…"
- "Didn't allow for real life application & discussion."
- "Not the way discussions work & my brain works."
- "Not useful. Too abstract."
- "The basic questions get answered in the 1st few postings. Then no one has much more to say other than a paraphrase of previous postings."
- "Not applicable to me – motivated only by it being a class requirement."
- "While some of these topics were of importance, I found myself just commenting in the discussion because it was a requirement for participation. The large group discussions were harder to follow with so many class members and I felt that at times people were ignored in them. Part of this was because we did have such as large class and often someone would state what you wanted to say before you got to it, then you had to stretch to figure out something else to say so you were an active participant."

Even so, the anonymous course feedback in WebCT became one of the most popular forums for the courses large group discussion. In one of the courses, a vivid discussion in this forum voiced the students' opinions on how to design the collaborative forums. The first posting in this discussion read as follows:

Message no. 1279[Branch from no. 239]
Posted by Anonymous on Monday, September 19, 2005 7:52am
Subject: Re: A few comments

I am mystified -- and disappointed -- that many "participants" haven't treated the on-line discussions as a chance to interact with their classmates and actually learn by DISCUSSING! It is a DISCUSSION forum. It is not supposed to be a short answer essay where you simply turn in your answers by the deadline. There is not much participation in the chat sessions either, despite the instructor's efforts to accommodate those who complained about the scheduling.

This posting initiated an intense conversation among the students on the format of the course weekly discussions. It prompted a sequence of replies. The following excerpts illustrate the content of such debate.

Message no. 362
Posted by Anonymous on Monday, September 19, 2005 10:11pm
Subject: Discussion Questions
I would appreciate our discussion questions being on more of an analytical or reflective level so that it is easier to think of the topics from various points of view and situations.
So far, they have seemed so straightforward that within the first few postings, we basically have the questions answered and those of us that don't post within the first few days are left with nothing to add.

Message no. 419[Branch from no. 412]
Posted by Anonymous on Wednesday, September 21, 2005 4:33pm
Subject: Re: Discussion Questions
Perhaps we should be challenged as students to make that leap ourselves after we have answered the factual elements of the discussions.

Message no. 436[Branch from no. 419]
Posted by Anonymous on Wednesday, September 21, 2005 9:15pm
Subject: Re: Discussion Questions
I believe some already have, but might be worried because they haven't specifically answered the question. But, to do otherwise might make their comments seem redundant with all the others.

Summary of the Findings

Small group as opposed to large group discussion was the preferred format. Students described this discussion format as easy to follow and more private in the sense that they could share their thoughts in a safer environment. They also felt that their voice was actually heard rather than getting lost in the midst of a large group.

Discussions around miscellaneous questions that emerged from the students' professional practice and/or their needs exhibited higher levels of participation. Discussion topics were suggested by the students based on the needs of their current practice and in relation to the topics addressed in the courses. Students found these topics to be more concrete and accessible. They mentioned that when these topics arose they could thoughtfully contribute to the discussion as they felt well versed on the questions and showed high levels of interaction. Leveraging their areas of expertise and prior knowledge in these discussions was also a positive aspect reported.

Discussion facilitated by peers as opposed to the instructor was identified as the most popular collaboration design. When the discussion was moderated by the instructor many students treated the discussion questions as short answer essay questions and not as interactive discussion. Large group discussion facilitated by the instructors was not found as compelling or meaningful, as everyone "answered the same thing." The only motivation for students' participation was it being a class requirement. On the contrary, when facilitated by peers, students felt really connected during the discussions and motivated to participate. Peer facilitation fueled participation among students and created a strong sense of community.

Conclusions

This study reported the design and analysis of two online graduate courses for K-12 teachers. Student participation in a range of differently designed forums was analyzed to discover key aspects of the discourse and related pedagogy.

Small group discussions that grew out of miscellaneous questions emergent from the students' practice as teachers and facilitated by peers was the design of collaboration preferred among the majority of the participants. With peer questions, there were many questions—some with which students could not connect and others that worked well. Having a choice of questions to answer helped students. As one student explained: "Group participation was higher amongst all participants when the discussions were student led around student-needs topics and in a small group. We were able to talk back and forth more during the smaller discussions than during the large ones and we could receive more feedback from our peers."

Independently of discussion formats, levels of engagement decrease if the remaining coursework is not closely related to the discussions. If this happens, the discussions become something students would do on their "spare" time working on class projects. Therefore, low participation should be expected.

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Trust and Performance in Virtual Teams

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Introduction

Trust has been identified as a benefit for team-based organizations; however it is essential to investigate how these benefits translate to virtual teams. This poster identifies critical elements and outcomes of trust building in virtual teams as well as describes relationships between them.

The Problem

At the university level, students should be given an opportunity to experience virtual teamwork as they must be prepared to communicate across cultural and organizational boundaries using technology. In the twenty-first century, learning while working together is becoming mandatory to meet workplace performance requirements, and students need to have authentic experiences in this area while earning a college degree. However, the challenge appears to be in designing and supporting high-performance teams as well as using technology effectively to facilitate teamwork. This challenge creates a major impediment for instructors to integrate team-based learning strategies and to continually improve team processes. The purpose of this study was to examine the relationship between trust and performance in virtual teams, since trust has been identified as the defining issue in understanding virtual teams.

The Purpose of this Study

The goal of this poster is to showcase a research on trust and performance in virtual teams. Because there is no conceptual agreement on the development of trust in virtual teams as well as its relationships with team performance (Langfred, 1998), this exploratory study is intended to explore this issue.

The Proposed Framework of Trust Building in Virtual Teams

Trust is defined in this research as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (Mayer, Davis & Schoorman, 1995, p.712). The proposed framework of trust building in virtual teams illustrates relationships between trust and team performance. It identifies antecedents of trust constructs as well as outcome (i.e., team performance). The five elements that are critical to facilitate trust building in virtual teams include:

- Initial trustworthiness, which represents one's readiness to have confidence in other team members. The trusting building process initiates with an individual determining if a person or organization may be worthy of trust.

- Competence, which recognizes that all team members have the requisites, adequate knowledge and skills, and the qualities for the work.
- Integrity, which consists of the firm adherence to a code of work ethics and relates to fairness.
- Respect, which is linked to consideration of others, esteem, and acceptance of others' ideas. It is the willingness to take seriously others' ideas and suggestions and often is showing care for others.
- Communication skills, which is the ability to share information and establish personal rapport with team members. It is related to the quality of how one communicates with others. Becoming more skillful in communication often means becoming more empathetic and expressing what one is saying in ways that invite cooperation, promote harmony, and provide constructive criticism.

Environmental and contextual factors, described here as situational mediators, were included in the framework, as follows:

- Heterogeneity of virtual teams.
- Technology and communication level consists of the ability to access and use available technologies and how these technologies are used to communicate (e.g., frequency of use).

In this study, team performance was defined as a result of teamwork products and processes and the relationship between the two. Teamwork processes are series of activities conducive to:

- Efficiency processes that avoid loss or waste of energy, time, and money;
- Effective processes that create the desired effects (e.g., good grades and good performance reviews);
- Innovation of processes (application of new ideas to ensure processes' optimization).

Teamwork products are results of cross-border virtual teams' processes that contribute to:

- Team member satisfaction, that is, fulfillment of their needs or wants, professional growth, interpersonal relationships, sense of belonging, and pride;
- Quality of an outcome (e.g., product, service, idea);
- Innovation of the outcome (solution, product or intervention) to pressing challenges.

Research Methodology

Three courses–graduate and undergraduate level–and 18 teams of 2-5 members each participated in this study. These courses were offered as part of programs in Textile and Clothing and Instructional Technology in a large Midwestern university. The undergraduate students were mostly from the USA apart from 3 students from Canada, Taiwan and South Korea. Their ages ranged 18 to 29, and they were mostly females. Graduate students showed a dispersed age range from 24 to 48, and distributed citizenship among USA, Turkey, India, Ukraine and Denmark. This sample was equally distributed between male and female.

A mixed method approach was used. Qualitative and quantitative types of data were collected to identify critical elements and situational mediators in the trust-building process and the role of trust in team performance. Face-to-face and web-based videoconferencing interviews were conducted with individual team members. Logs from chat and videoconference session were also analyzed. The quantitative data were collected over a four-month period by administering three versions of a web-based survey. The survey measured the constructs proposed by the framework of trust building in virtual teams. Team performance was determined by self-evaluation and the instructors' grade.

Preliminary Findings

Be free to select any number and type of communication tools to support virtual collaboration was a common theme across all teams. None of them relied solely on a single medium. Instead, the teams preferred to use three to five technological platforms that performed diverse functions to suit various needs at different stages of the collaboration process. Participants believed that synchronous and asynchronous tools complemented each other and served different needs.

The results indicate that the higher the levels of trust, the higher the satisfaction with the project and the teamwork itself. Additionally, data analysis showed that:

- Trust development takes time and evolves as the project progresses; some of the projects were not lengthy enough to facilitate this development.
- Communication was the key to facilitate trust development.
- Organizational climate that supports social interaction was identified as an important factor as well.

Some of the factors identified as hindered trust development were: (a) delegating tasks to people who team members do not know well, (b) not having a formal team leader assigned to the team, (c) different styles of communication, and (d) different levels of commitment to the project.

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Where's the Oscar Award for Outstanding Online Instruction?

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The Oscar Award for Outstanding Online Instruction goes to... The most interactive course… NO… The course with the best instructional strategy… NO… The course with the best media… NO…. How do we decide? How you define "outstanding instruction" changes the outcome of any award system as much as adding different beads to a Kaleidoscope. This presentation will review research comparing and contrasting six rubrics used to evaluate online course quality.

If there were an Oscar award for outstanding online courses, how should we determine the winner? Perhaps we simply should have individual awards like the Oscars have, such as best actor, best actress, best director, best music score, etc. For online courses we could offer awards for best instructor, best media, best instructional strategy, best content, best use of interactivity, best communication between students and instructor, best methods for collaboration between students, etc.

However, just as the Oscar judges pick one best film that overshadows the other awards, shouldn't we be able to pick one best course? If we did pick one best online course, what criteria should we use to determine the one best course? Should it be based on an equal balance of the other factors, or should we weight one factor more than the others? And what should those factors be?

Our belief is that instructional strategy is the most important factor for a hypothetical online course quality Oscar award, but what is our justification? This paper reports on a three-year study focusing on online course quality, which has helped us identify the criteria for our mythical online course Oscar award. We describe the four phases of our study and the results of each.

The thesis of the overall study was that online courses should employ effective instructional strategies, specifically Merrill's First Principles of Instruction, in order to achieve the highest quality. Merrill's first principles were deduced from the research literature on instructional theory, models, and standards for instructional design.

Phase I

The purpose of our study was to determine to what extent award-winning online courses, which are supposedly of high-quality, use Merrill's first principles. If award-winning online courses intuitively use Merrill's first principles, the construction of high quality courses would benefit from including Merrill's first principles in the development process.

In the first phase of the study, two raters (one an instructional design expert, the other not an instructional design expert) evaluated seven award-winning courses using Merrill's 5 Star Instructional Design Rating and six other online course evaluation rubrics.

The award-winning courses scored fairly high on both Merrill's rating and the other rubrics. The data seemed to indicate that award-winning courses generally apply Merrill's principles of instruction. However, interrater reliability between the raters was problematic for some courses and some rating forms, so the results are inconclusive.

Phase II

For the second phase of the study we added a baseline course which had been developed based upon Merrill's first principles of instruction. We added three instructional design experts as raters, and used only Merrill's 5 Star Instructional Design Rating. Phase II confirmed that most award-winning courses tend to implement Merrill's First Principles of Instruction. A Bonferroni Post Hoc Comparison of Courses shows that there is a significant difference between the baseline NETg Excel course and the Digital Craft (mean difference = .63, sig. .002) and Evaluating Training Programs course ratings (mean difference = .84, sig.

.000). There is no significant difference between the NETg Excel course and the Research for the Classroom teacher, SAT, and Cashier Training courses. Figure 1 visually depicts these differences.

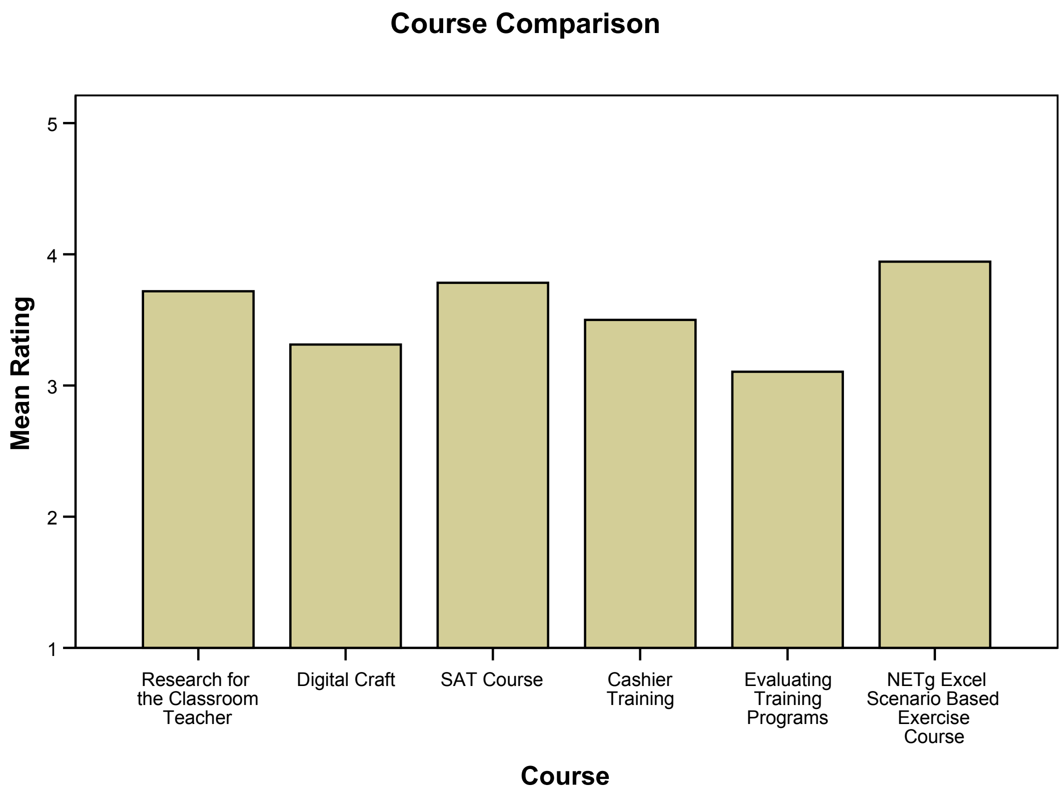


Figure 1. During Phase II of the evaluation The Research, SAT, and Cashier Training Courses scored effectively as high as the baseline NETg Excel course. The other two courses scored significantly lower.

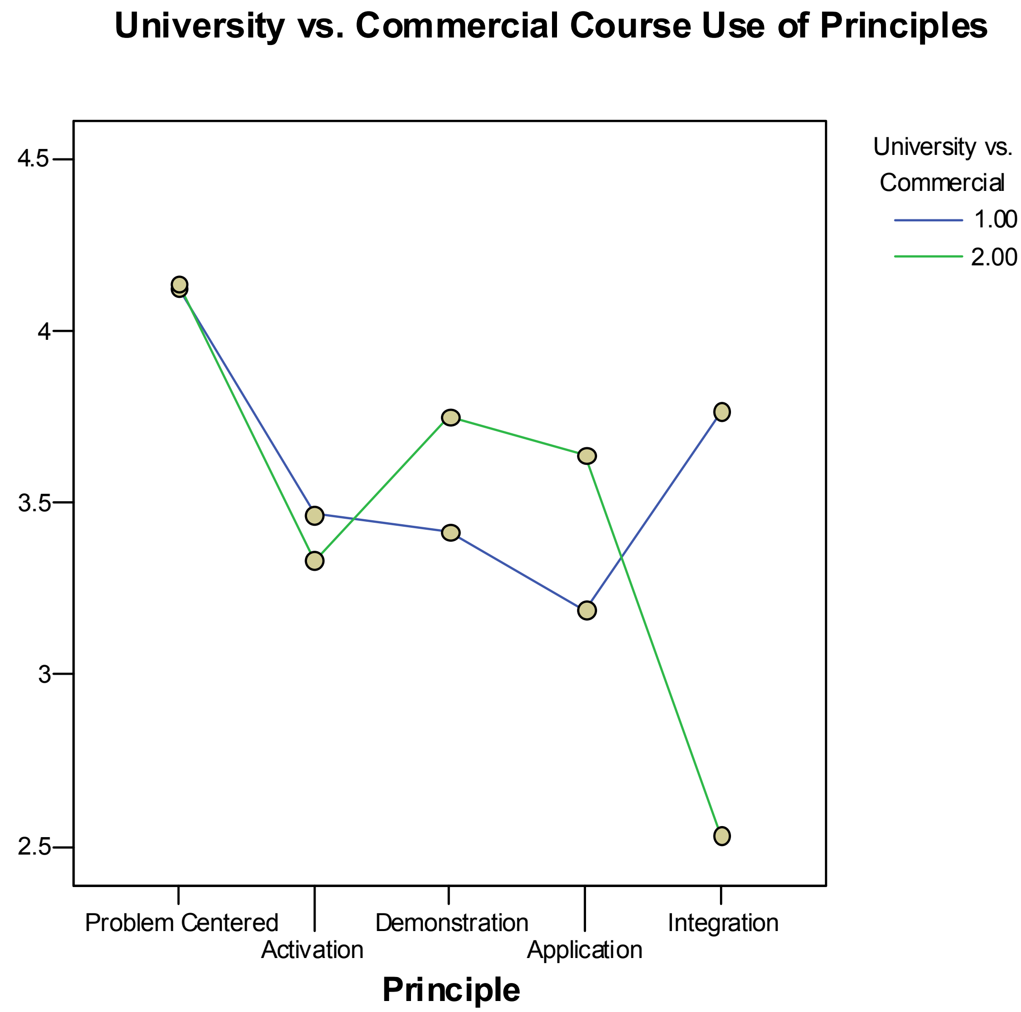


Figure 2. School courses scored high on integration possibly because instructors could assign students to do real-life application of learnings. Commercial courses scored low on integration because they were self-contained.

Also, ratings of award-winning courses tend to be closer than we expected to ratings of the course patterned after Merrill's principles. In addition, we concluded that there can be a wide variation in the implementation of Merrill's individual principles. For example, school courses scored high on integration, while commercial courses, which are self-contained, scored low on integration. Interrater reliability was high except on the problem-centered principle. The problem with interrater reliability dealing with problem-centeredness seemed to be because of rater confusion regarding the definition of problem-centered.

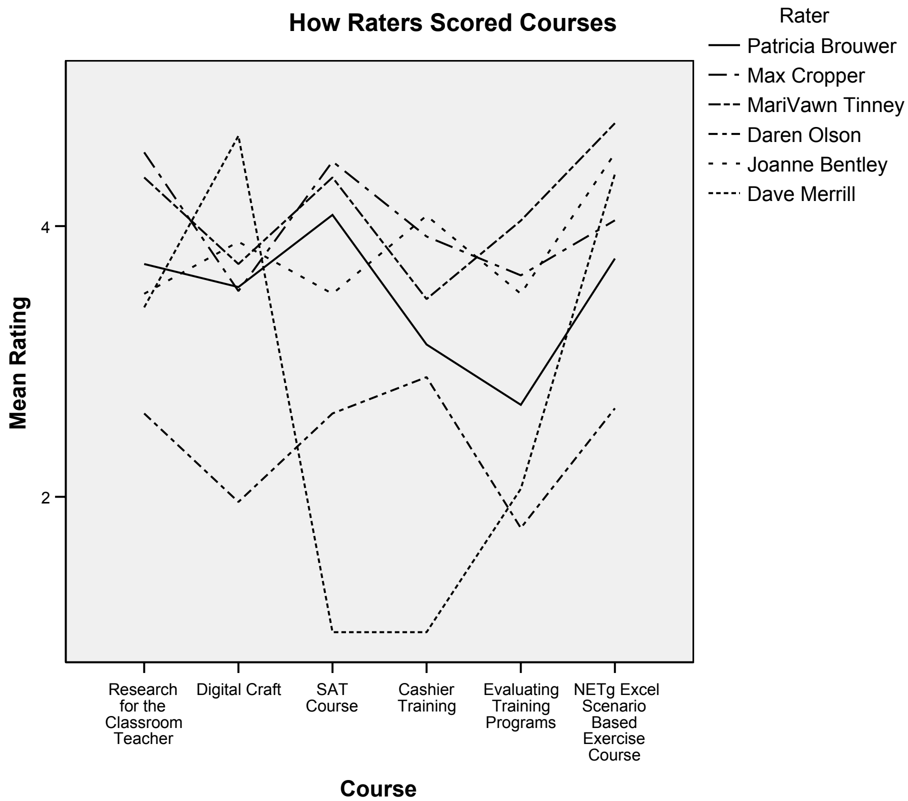


Figure 3. Comparison of raters and their ratings of course.

Phase III

For phase III of the study M. David Merrill, the author of First Principles of Instruction and the 5 Star Instructional Design Rating, served as a baseline evaluator. Having Merrill's ratings would help us determine if the other raters were evaluating the same way as him. When Merrill rated the courses, he modified the rubric to more closely match his intent, while keeping the scoring compatible with the study scoring method. Merrill scored some of the courses similarly to the other raters. However, two of the courses which the other raters scored high, Merrill scored extremely low. See figure 3. The reason for this rating discrepancy was caused by Merrill's progressively stricter definition of problem-centeredness. This discrepancy in scoring also suggests the need to have Merrill train the raters using his rubric, and to have raters reconcile ratings as they are trained on his rubric.

Phase IV

For phase IV of the study Merrill created a new version of his rubric and we had him conduct the training for his rubric. We had pairs of raters evaluate a new sample of online university courses, with each pair of raters using one rubric. The four rubrics used included Merrill's Five Star rubric and the three online school course evaluation rubrics which we used in phase I of the study. We selected the ten courses using a stratified random sample based upon student ratings from existing online courses at a western university. This helped us identify a range of quality of courses for evaluation. We selected three low rated courses, four medium rated courses, and three highly rated courses for the evaluation.

We trained each pair of raters on their respective rubric and had them evaluate the 10 courses using their assigned rubric. Each pair of evaluators reconciled their rating scores within one point of each other on the five point rating scale for each question on their rubric. Max and Joel evaluated all of the courses with all three rubrics, and also reconciled their ratings within one point for each question. Max and Joel's average rating for each question served as the baseline rating for each of the three online course evaluation rubrics.

Merrill was developing his new rubric as the study was being conducted. (Show page of rubric?) When he presented his rubric, raters for each of the other three rubrics, who had recently read Merrill's latest articles, commented that Merrill's five star criteria were significantly more substantial than the criteria for the rubrics which they had been using. When Merrill presented his rubric, he hadn't had time yet to provide a sample course rating. Because of the complexity of the rubric and the lack of a worked example, the raters for his rubric initially struggled with their rating, especially with the definition of whole tasks and task-centered strategy, which task-centeredness represents 30% of the total possible score. Another critical issue that surfaced was that some courses have a progression of tasks that lead to a whole task at the end, but Merrill's rubric penalizes those courses because it requires a course to use a series of whole tasks.

To deal with this issue, Merrill revised his rubric to provide some task-centered strategy points for a progression of non-whole tasks, but more points for having a progression of whole tasks. See adjusted portion of rubric.

Another serious issue is that Merrill's rubric gives extremely low scores to traditional information-based survey courses. Merrill's rubric only gives credit for demonstration, application, task-centeredness, activation and integration. It doesn't give points for explanation only, even if explanation is accompanied by illustrations. Merrill recommends traditional survey courses be converted to task-centered courses so that learners can apply knowledge, rather than simply memorize and forget volumes of information.

Merrill is currently creating another refinement of his rubric that will give hope for courses that currently score low. After his rubric is finished and all ratings are completed, we will do a statistical analysis comparing Merrill's rubric with the other rubrics.

Conclusion

Merrill's five star standards are high, but they provide significant improvement over traditional instruction. When raters assigned to the other rubrics were introduced to Merrill's first principles and his five star rubric, they concluded that Merrill's standards were much more important for course quality than the more peripheral criteria measured by the other rubrics. See table 1 for a comparison of the number of rubric questions written about various topics by each of the rubrics used in Phase I of the study..

So the Oscar award for outstanding online instruction goes to… the course that most fully implements Merrill's first principles. From the results to date we believe that Merrill's first principles should be the foremost criteria for determining online course quality. However, further research needs to be done to determine what factors influence online course quality the most, as we study the kaleidoscope of factors that influence online course quality.

Task-centered Analysis

- **Is there an actual whole task? ☐ If not what whole task is implied? ☐**
  Explain:

- **Describe the actual or implied whole task.**
  Description:

Follow the flow chart to score for the task-centered principle.
Add up to the number of points shown in the box for each question.
The total possible points = 30.

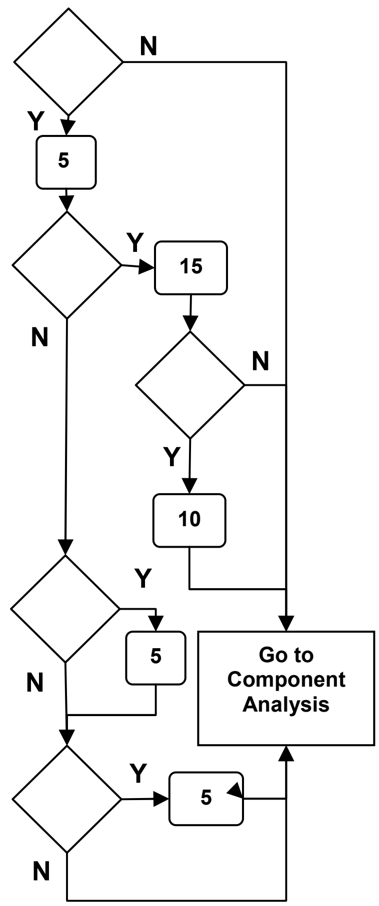
Score = Is there an authentic, real-world **whole task**?

Score = Is there a **task-centered strategy**?

Score = Is there a **progression of whole tasks**?

Score = Is the whole task **demonstrated**? Is the demonstration consistent with the type of learning involved? (See component scoring.)

Score = Are learners required to do the whole task? Is the **application** consistent with the type of learning involved? (See component scoring.)



Total Score for Task-centered (0-30) =

Figure 4. Task-Centered Analysis portion of Merrill's latest rubric. This version provides 15 points for a task-centered strategy and an additional 10 points for a progression of whole tasks. If the course includes a whole task, it could get 30 points for this portion of the rubric.

(Merrill, 2002) 1st Principles	5 Star Rating	Web CT	Texas IQ	SREB	Brandon Hall	ASTD	Other Guidelines
Problem Centered	**1**						
Learners are shown the task, rather than just given objectives	1	111	1	1	1	111111	
Learners are engaged at problem or task level	1		1		1		
Learners solve progression of problems	1						
Activation	**1**						
Learners recall previous knowledge, experience	1					1	
Help learner see relevance and have confidence in their ability to gain knowledge and skill	1						
Use a procedure to select the right content for each learner	1		111		11	111	
Learners given new experience for knowledge foundation	1						
					11	1	Engagement techniques
Learners recall structure for organizing knowledge	1	1	1				
			1				Support to prepare for entry level
			11				Test for entry-level skills
		1	111111111	1			Syllabus/ Course Requirements
Demonstration							
Demonstrate (show examples of) what is to be learned	1	11		1	1		
Demonstration consistent with learning goal	1		11		1	1	
Examples and non-examples for kinds -of (Concepts)	1						
Demonstrations for how-to (procedures)	1						
Visualizations for what-happens (processes)	1						
Appropriate learner guidance	1						
· *Learners directed to relevant information*	1						
· Multiple representations used and compared	1						
Learners assisted to relate the new information to the structure that was recalled or provided	1						
Relevant media used	1	1111	11111111	1	lllllllllll	1	
		1	111	1		1111	Adequate content and resources to meet learning goals and objectives
Application	**1**						
Practice is consistent with objectives	1	11	11		1111	111	
Information -about practice requires learners to recall or recognize information.	1						
Parts-of practice requires the learners to locate, name, and /or describe each part.	1						

Table 1. Comparison of the various online course evaluation rubrics.
Each “1” indicates that a question for the given criterion was included on the rubric. Multiple 1s indicate that multiple questions on that criterion were included on the rubric.

(Merrill, 2002) 1st Principles	5 Star Rating	Web CT	Texas IQ	SREB	Brandon Hall	ASTD	Other Guidelines
Kinds-of practice requires learners to identify new examples of each kind.	1	1					
How-to practice requires learner to do the procedure.	1	1					
What-happens practice requires learner to predict a consequence of a process given cognition, or to find faulted conditions given an unexpected consequence.	1	11	1				
Practice followed by corrective feedback and an indication of progress, not just right-wrong feedback.	1	1	111111	11111	1	1111	
Diminishing coaching	1					1	
Varied problems	1						
		1	1	1			The content and requirements are as demanding as a face-to-face course.
		1					Assignments and projects that require students to make appropriate and effective use of external resources.
		1		1		1	Clearly communicated assignments.
		1					Explicitly communicated expectations, including deliverables.
Integration	1						
Public demonstration of knowledge	1						
Reflection, discussion, defending knowledge	1	1					
Creation, invention, exploration of ways to apply knowledge	1						
Implementation							
The instruction facilitates navigation	1	1	11		111		
The degree of learner-control is appropriate for the learning goals and the learners	1		1		11		
Collaboration is used effectively	1	111111	111111	1111			
Instruction is personalized	1						
		1111	111111111				Effective use of online technology
				1			Provision is made for students with special needs
					1		Is the interactivity creative – Are expert design practices used?
			1				The course provider's credentials are available for review.
			1				Has the course been developed by a qualified team consisting of content experts and instructional designers?

Table 1 cont. Comparison of the various online course evaluation rubrics.

Universal Design Principles: An Overview

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The term "universal design" is frequently used by educators and Web developers when discussing the creation of accessible electronic communication. This paper provides a general overview of the universal design concept. It then discusses ways in which universal design concepts can be utilized in order to help make Web-based electronic learning materials more accessible for individuals who have disabilities. Finally, this paper notes how universal design can provide added value for on-line learners who do not have disabilities.

Universal Design

The term "universal design" was originally coined during the 1970s by Ron Mace at North Carolina State University in order to describe a concept that had emerged in the field of architecture (Tobias, 2003; Vanderheiden & Tobias, 2006). Since that time the universal design concept has been adopted by many additional fields including the computer industry, telecommunications, education, and information systems (Tobias, 2003).

Vanderheiden and Tobias (2006) claim that universal design has two major components. First, universal design refers to the designing of commercially available products that can be used by the greatest number of people without the need for assistive technologies. Second, universal design refers to the designing of products so that they are compatible with available assistive technologies. Vanderheiden and Tobias also claim that universal design is a process, not an end product; therefore, there are no universal designs or universally designed products.

Connell et al. (1997) posit that there are seven basic principles of universal design. First, when creating a product, the designer should ensure that the product or design provides equitable use to all users regardless of an individual's ability or disability. Second, the product or design should provide flexibility in use so that it accommodates a broad range of individual preferences and abilities. Third, the product or design should be simple and intuitive in its use. Fourth, the product or design should be capable of communicating all essential information under any ambient condition regardless of the user's ability or disability. Fifth, the product or design should minimize any hazards or adverse consequences arising from accident misuse. Sixth, the product or design should cause only minimal fatigue when used properly. Seventh, the product or design should be ergo-dynamically appropriate for the user regardless of the user's ability or disability.

Tobias (2003) points out that the term "universal design" can be misleading in that it suggests that there is one single product that will be equally accessible to every individual. Tobias corrects this misunderstanding by suggesting that no one is able to create a product that will serve the needs of every imaginable user.

Tobias (2003) notes that there are currently two general strategies regarding universal design. The first universal design strategy is to make a given product's features easier to use. Tobias notes that in theory a product's features should be designed so that they do not impose any burden on any user regardless of ability or disability. The second universal design strategy is termed by Tobias as redundancy. Tobias notes that redundancy means that a product will have multiple modes of interaction. According to Tobias, more interaction options offered by a product equals more opportunities for all users to succeed in using the product. Tobias also notes that redundancy is commonly built into many software products.

Universal Design and On-line Learning

Waddell (1999) posits that the concept of universal design pertains to computer information systems and telecommunications in that it calls for the development of information systems that are flexible enough that they can accommodate the needs of the broadest ranges of users of computers and telecommunication tools, irrespective of an individual's age, ability, or disability.

Burks and Waddell (2001) assert that there are two primary ways that the universal design process applies to the Internet. First, the content material should be designed in such a way that it is able to meet the needs of the broadest range of users regardless of age, language, or disability. Second, the Internet technology should also be designed so that it can be accessed by the broadest range of users regardless of age, language, or disability.

Opitz (2002) notes that the Center for Applied Special Technology (CAST) is supporting the universal design process by promoting the use of versatility and flexibility within the design of on-line presentation materials.

Opitz notes that CAST promotes the tenet that students who have disabilities reside on a continuum of learner differences rather than comprising a discrete category of learner. Opitz claims that CAST promotes a universal design concept in which the instructor adjusts the curriculum material in order to meet the needs of all learners, not just those who have disabilities.

Tobias (2003) posits an approach to the universal design of on-line learning materials that is similar in philosophy to Gilbert's (1978) third leisurely theorem. Tobias purports that the origin of disability does not emanate from a dysfunctional or broken person; rather, the disability is in essence the gap between what a person can actually perform and what the environment demands. In this manner, the universal design process becomes one of removing the obstacles that are creating the performance gap.

Hendricks et al. (2003) suggest that vendors of technology need to take a more proactive role in ensuring that universal design specifications are put into product development. Hendricks et al. claim that if more vendors incorporated universal design specifications into their product development, technology would be innately accessible, thereby reducing or eliminating the need for educators to provide additional technologies to students with disabilities.

Rowland (2000) points out that postsecondary students with disabilities (on-line or face-to-face) routinely require computer interaction to (a) gather information about required courses, (b) resister for classes, (c) look up transcripts, (d) order books, (e) pay for classes, (f) utilize course management systems, (g) conduct research from library holdings or from the Internet, (h) get web-based information concerning campus activities, and (i) take on-line tests. Thompson, Burgstahler, and Comden (2003) illustrate the pervasiveness of Internet usage by universities by pointing out that the University of Washington had more than 200,000 web pages on its primary web server in the year 2002. Thompson et al. also claim that the University of Washington had several hundred thousand additional web pages on its ancillary web servers.

Burgstahler (2004) offers the following seven-step process for applying the universal design process to an educational product. First, define the application (web site or other delivery modality) that you anticipate using for your product. Second, define the target audience that you anticipate will use the application. Third, identify the potential diversity (diversities) that may exist within the group. Fourth, apply universal design or other design principles to the design of the product. Fifth, apply universal design or other design principles to the design of the subcomponents of the given application. Sixth, develop procedures that will address the accommodation needs of specific individuals with disabilities for whom the standard application design does not inherently provide access. Seventh, test the application by using it with a diverse group of individuals who have differing abilities and disabilities.

Examples of the Universal Design Process in Distance Learning

The literature reveals several examples of the how the universal design process is being utilized to increase the accessibility of on-line learning, communication, and information.

Kerscher (2004) reports that the world-wide standard known as the Digital Accessible Information System (DAISY) is now recognized as an ideal approach to making content accessible to all users. DAISY uses semantically rich extended hypertext markup language (XML) to transform textual information into a multimedia product that offers multisensory access to text through the use of images and sound. Kerscher notes that DAISY was created with universal design in mind and is currently a collaborative effort of the world-wide publishing industry.

Edmunds et al. (2005) notes that the Center for Assistive Technology and Environmental Access (CATEA) has recently created an on-line learning object that can be utilized by all students, including those with disabilities.

Curb-Cuts and other Benefits to Society

Kinash et al. (2004) mention that disability advocates and authors often use the metaphor of "electronic curb-cut" to describe universal design. Curb-cuts (the portion of the sidewalk that creates a ramp from the sidewalk to the street) were originally put in place to be used by individuals with disabilities who used wheelchairs. However, after a very short time period, curb-cuts rapidly gained popularity with individuals who were nondisabled such as mothers with strollers, travelers with wheeled luggage, shoppers with carts, and cyclists. French and Valdes (2002) claim that that the universal design process helps create accessible technology that can help all students, not just those with physical disabilities or students who use assistive devices.

Burgstahler (2002b) points out that one such electronic curb-cut is the alt tag. Alt tags have been designed to describe images that are placed on web pages to individuals who are visually impaired by providing text descriptions of images. These (alternate) text descriptions of the images can be read to computer users who are visually impaired. Since their inception, alt tags have proven to be useful in a number of ways for computer users, both disabled and nondisabled. Search engines such as Alta-Vista and Google commonly locate images on the Internet by searching a web site for alt tags that contain a matching search term. Alt tags also permit individuals with slow Internet download speeds to turn off the image availability on their browser in order to maximize the download of content. Other examples of assistive technologies that provide benefit to nondisabled people include the use of real-time text captioning in video materials as a teaching aid by individuals for whom English is a second language (French & Valdes, 2002). Text captioning also provides benefits to individuals who are viewing television in a noisy environment by providing a visual-delivery vehicle for the audio content of a multimedia presentation (Burgstahler, 2002b). Opitz (2002) purports that the universal design process can increase the opportunity for learning for students who are nondisabled and have different learning styles and abilities because (in theory) the universal design process offers instruction in a variety of formats that can appeal to the entire learning audience.

Calls for More Research Pertaining to Universal Design

The literature appears to indicate that the concept of universal design is gaining ground (Moore, 2004). However, the universal design concept does not yet appear to be fully embraced by everyone in the educational community. Kinash et al. (2004) note that many current published works relating to on-line accessibility tend to relegate the concept of universal design to the practice of altering existing courses by "modifying the norm for the perceived abnormal" (p. 7). Wehmeyer, Smith, Palmer, and Davis, (2004) claim that more research is needed to discover which universal design features provide benefit to on-line students with cognitive disabilities. Abell, Bauder, and Simmons (2004) claim that more research is needed in order to help advance policies and promote initiatives that are aimed at encouraging universal design in order to improve access to technology by individuals who have disabilities. Cavanaugh (2002) notes that as the population of the United States continues to get older, there will be an increasing need for technologies that incorporate universal design principles.

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Teacher Education Goes Into Virtual Schooling: Developing National Models for Virtual Schooling Experiences

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Abstract

Virtual Schooling (VS), or K-12 distance education, has become part of legislated school reform and improvement in many states, including Florida. Distance education is now established in K-12 schools and the preparation of new teachers must evolve too. Key roles in VS are: VS site facilitator, VS teacher, and VS designer. This paper presents a kaleidoscope of work in our national project “Teacher Education Goes Into Virtual Schooling,” and is particularly relevant to those in teacher education and distance learning. Descriptions of three VS models and real-life examples of these models are reflected in our VS lab scenarios plus their evaluation in two programs of preservice teacher education.

Introduction

Virtual Schooling (VS) is rising in both popularity and importance (Clark, 2001; Setzer, Lewis, & Green, 2005; Zucker & Kozma, 2003; NFES, 2006; Watson, 2007; Roblyer, 2008), becoming part of legislated school reform and improvement in many states, including Florida. In light of the increasing demand for virtual courses and the rapid expansion of schools to meet the demand, it is apparent that there is a need for teachers who are prepared to teach at a distance from their students. Research indicates that the online instructor's role requires a paradigm shift in perceptions of instructional time and space, virtual management techniques, and ways of engaging students through virtual communications (Cyrs, 1997; Easton, 2003; Rice, 2006).

There is a complementary need for VS Site Facilitators and other support personnel who understand the benefits and demands of this new mode of education and are prepared to meet its needs and requirements. Research in K-12 VS shows that a ‘distant’ teacher should be complemented with an adult who facilitates students learning at a distance (Aronson & Timms, 2003; National Education Association, n.d.; Davis & Niederhauser, 2007). Therefore, VS is more likely to have a beneficial impact if all K-12 teachers become competent as a VS Site Facilitator.

To help meet this need, the goal of the “Teacher Education Goes into Virtual Schooling” (TEGIVS) project is to create a national model that integrates VS into preservice teacher education in four collaborating institutions (Iowa State University, University of Florida, University of Virginia, and Graceland University). VS curricula are being developed for three roles: VS Site Facilitator, VS Teacher, and VS Designer. This paper describes three VS models accompanied by examples of these models reflected in VS lab scenarios. In addition, the formative evaluation is also described.

A Virtual Schooling System

The virtual classroom includes a teacher and groups of students who are distributed among two or more distant schools. The teacher may also have a local class. Rather than meeting in a traditional classroom, the teacher and students communicate and share resources using digital technologies, such as email, videoconferencing, and/or a Web-based learning environment (e.g. Blackboard or Moodle). The three key roles in a VS system are VS Site Facilitator, VS Teacher, and VS Designer. In the typical VS course shown in figure 1, instructional designers (D) create instructional activities and materials with and for the teacher; the VS teachers (T) take on responsibilities including teaching, facilitating, monitoring, evaluating student learning, and coordinating the overall VS experience. Each VS Site Facilitator (F) provides immediate, personal, face-to-face communication with students, engages in local problem-solving of many types, and mentors students. Students (S) rely on VS Site Facilitators to provide information about VS possibilities, instructional support when taking VS courses, coordination of VS facilities, and access to VS resources. These key players are supported by administrators (A), instructional technology coordinators (IT) and the students’ parents or guardians (P). Of course, there is considerable overlap in these roles, and in some situations; individuals may take on multiple roles. Technology-mediated communication that occurs between and among teachers and students in the VS classroom is essential for success (Harms. Niederhauser, Davis, Roblyer, & Gilbert, 2006).

An example of this type of virtual schooling system can be seen in some of the courses provided through Iowa Learning Online (ILO). ILO has produced several high quality science courses to meet demand in Iowa, where there is a chronic shortage of science teachers. ILO recruits and registers students, manages teachers and quality assurance, and supports and maintains hardware, software, and related instructional design in collaboration with Iowa Public Television. ILO has developed training for the ILO coaches at host schools (coach is the ILO term for the VS Site Facilitator). Figure 1 was developed by the project to distill the practice first developed by their lead mentor teacher Gail Wortmann in her teaching courses of Anatomy and Physiology, which won a WebCT award. This course was used in one of the TEGIVS secondary lab scenarios called 'Nick's Online Anatomy/Physiology course' (http://www.public.iastate.edu/~vschool/TEGIVS/VSLab/vs%20scenarios/Scenario3/index.html).

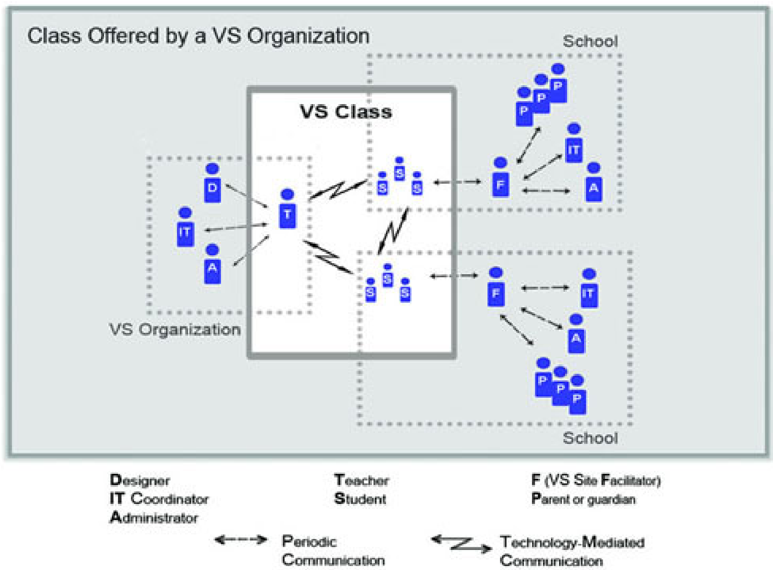

Figure 1: VS model 1: Class offered by a VS organization to students in two regular schools

The project developed figures for two further models in order to reflect the variety of VS experiences. The model in figure 2 depicts tele-collaboration that supports collaborative learning and teaching between two distant classes. According to Judi Harris (2001) tele-collaborative learning activities create valuable opportunities to expose students to multiple points of view and experiences, to communicate with a real audience using written language, and to expand global awareness (Harris, 2001), providing they are carefully designed. An example of this tele-collaboration was depicted in the TEGIVS "Teddy Bear" Scenario (http://www.public.iastate.edu/%7Evschool/TEGIVS/VSLab/ElementaryVersion/Scenario4/index.html) developed for elementary school teachers using the International Education and Resource Network's (iEARN) Teddy Bear project (http://www.iearn.org.au/tbear/ with permission). That project stimulates on-line collaboration between children in different cultures though exchange of teddy bears, in order to enhance understanding and acceptance of diverse cultures. Children participate in the discussions as individuals or as a whole class with the guidance of their teachers.

The third VS model shown in figure 3 depicts an additional section taught by one teacher in two classrooms connected by a videoconferencing system. An example of this model was drawn from a case study collected by two of the authors in Iowa. The TEGIVS secondary lab scenario 'Danielle's Chemistry Class' is set in this context and the additional web resources link with the original case study and related guidance (http://www.public.iastate.edu/~vschool/TEGIVS/VSLab/vs%20scenarios/Scenario2/index.html).

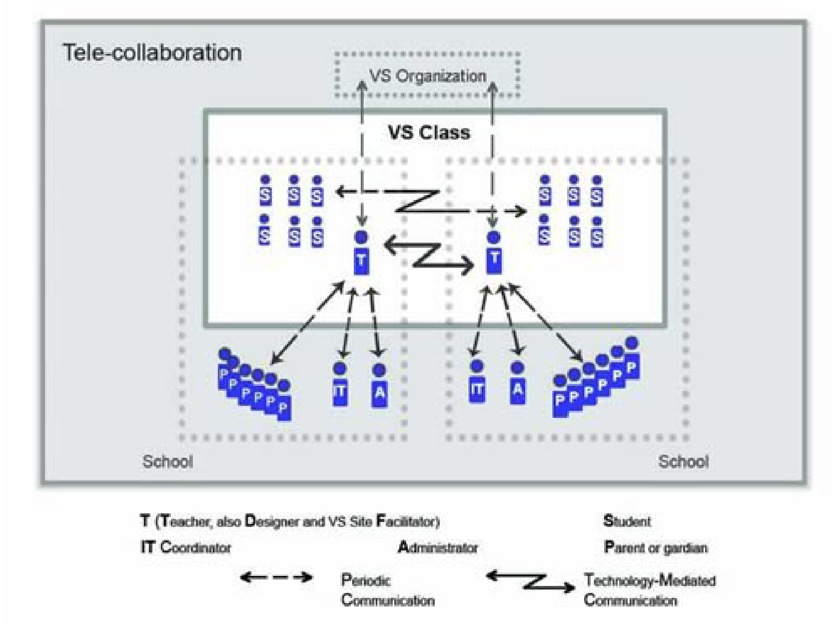

Figure 2: VS model 2: Tele-collaborating classrooms

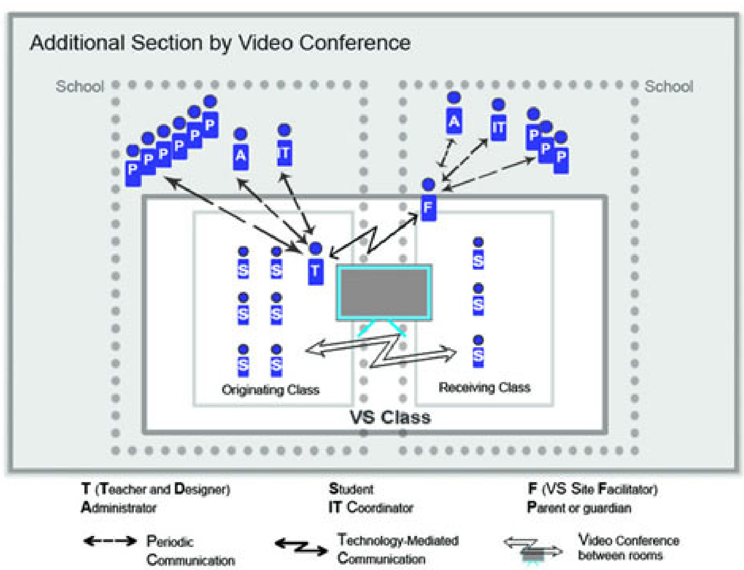

Figure 3: VS model 3: Teacher teaching an additional section of the class in a distant school.

Virtual School Lab Tool Development

The goal of the TEGIVS project is to create curriculum and related tools that are easy to adopt nationwide. The rapidly evolving kaleidoscope of VS described by Roblyer (2008), plus the variety of technologies and issues across differing content areas was a big challenge. Specifying three models helped to clarify some of the diversity. In addition, the TEGIVS team decided to specify the VS curriculum and then repetitively prototype both the curriculum and the tool interfaces in order to develop VS Lab tools that could be adapted to the variety of preservice programs in the US. The process began with a brainstorm session that ended with grouping the various aspects of VS into four main categories, namely: pedagogy, technology, assessment, and VS classroom management issues.

Then, the contexts were chosen for the secondary cases where multimedia was available, which were a high school foreign language course and two high school science courses. Fictional scenarios that challenged viewers were created in order to address the specific issues in using VS, including VS implementation methods, and ways to organize learning within the VS environment. They aimed to illustrate different aspects (pedagogy, learning environment, assessment, and challenges) so as to complement one another without repetition of specific items.

In terms of pedagogy, the fictional scenarios illustrate how VS courses may be structured using different learning approaches including didactic inquiry and problem-based learning. The communication and interaction among the VS teacher, students, and content, different teaching strategies such as individual and group work, and variations in the flow of communication in VS courses were illustrated in designing VS curriculum. The issue of evaluating learning in a VS context was illustrated with several methods of assessment including reflections, proctored and performance-based tests, and quizzes. The three common and contrasting technologies used in VS courses were selected: managed learning environment (WebCT), classrooms connected via live videoconference (Iowa Communications Network), and a multimedia audio conferencing interface (Elluminate). Additionally, the scenarios presented a range of tools used to support the learning process with both synchronous and asynchronous modes including discussion boards, chat rooms, audio/video, email, and whiteboard.

Following the successful piloting of the secondary lab, the elementary team teaching the Iowa State University course that introduces instructional technology in the early childhood elementary teacher education program requested a lab more suited to their students. This TEGIVS elementary lab takes a slightly different approach in setting the fictional scenario in a more realistic context of a newly graduated teacher in a grade 1 class for the teddy bear scenario and a middle school class for "Max Takes Math From Hospital." The instructor and her teaching assistants were pleased with the result.

These materials have been tested with 77 elementary and 21 secondary preservice teachers from Iowa State University and 133 students from the University of Florida in the fall 2006. The elementary lab has also been successfully tested. Results from the usability test (See Table 1 in Appendix 1) indicated that students were generally favorable in their ratings of the tools but also had many recommendations for how to improve their usefulness. The evaluation of the pilots and findings from these initial studies are described in our article in The Internet and Higher Education (Davis, et. al, 2007). The University of Virginia and Graceland University will adapt and pilot these experiences into their content-specific introductory course and methods course respectively in fall 2007.

Virtual Field Experience

VS has also been introduced in an additional course at Iowa State University that prepares preservice teachers for field experiences in regular schools. The first pilot simply used web pages with readings and responses that were emailed to the instructor. Students were required to read news articles on VS and place them in the context of their growing understanding of the US educational system. The articles used covered the topics of VS myths, legislature challenges, and impact of VS on student learning and were included to stimulate more discussions and responses. They were also required to respond thoughtfully to questions set by the instructor, who used these during a debriefing seminar. This was improved in the following semester with the creation of a course in Iowa State University's WebCT course management system as the tool. While maintaining focus on the content, tasks were organized and designed to expose students to several functions and options available in such an environment, e.g. online assignments, assessments, and threaded discussions. The interface improved tracking and organization. The new tool, WebCT, provided a secure interface for preservice teachers to post their responses, since passwords and user identifications were necessary. Compton, Follett and Desmiraslan (2007)conducted a preliminary analysis of the preservice teachers' reactions and responses in the fall 2006 trial. Their findings also indicate the importance of communicating the range and diversity of VS and the need to create virtual field experiences in virtual schools.

Conclusions and Future Opportunities

The TEGIVS project is building VS competencies by developing tools that can be shared within the teacher education community. Initial findings suggest that such a tool can influence future educators' thinking about the colorful kaleidoscope of teaching and learning in the 21st century. Multiple and crisscrossed tours are necessary through the complex and ill-structured domain of teaching, (Spiro et al., 1988) and we are sure that this also applies to teaching online.

We believe that the approach of repetitive prototyping to create materials that are easy to redevelop and adapt to the wide range of approaches to preservice teacher education is particularly important to the kaleidoscope of

VS. We aim to release all our materials under a Creative Commons license in order to facilitate further development both of scenarios and tools. It will be important to have scenarios that reflect pedagogic content knowledge, which varies with the age of the learner and their context.

Therefore, the courses in each of the three partner universities will create further materials. In addition, the field and internship experiences for students will result in continual updating of technology within our program at Iowa State University. In fall 2007 it is planned to incorporate VS in an additional course, this time in instructional design to improve its applicability to the design of materials and pedagogy for VS. All these trials and pilots will provide us with more evidence on the effectiveness of interventions in the preparation of teachers.

Furthermore, we are keen to hear from others who are engaged in or planning similar innovations in higher education. In terms of delivery, this ambitious attempt aims to influence a broader community of practice, in keeping with project goals. This project invites a re-examination of the complexity of both the subject of teaching and the context of teaching to teach. In the initial research, the medium of delivery, the curricular support, and the pedagogical strategies of implementation all provided both affordances and constraints to successful teaching and learning. If successful, the VS tools described here and those yet to be developed will reveal a new world of teaching and learning through the lens of VS practice.

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Appendix

Table 1. *Overall Results of Usability Ratings Sheets on VS Tools Across Sites for Fall, 2006 and Spring, 2007*

	Fall, 2006				**Spring, 2007**		
	Mean (High=5)	**SD**	**Avg. Sum (Possible=55)**		**Mean (High=5)**	**SD**	**Avg. Sum (Possible=55)**
ISU - Tour Tool							
CI 280	3.43	0.980	37		3.50	0.740	39
ISU - Lab Tool							
CI 201-Elementary	3.61	0.856	40		3.75	0.861	41
CI 202-Secondary	3.36	1.015	37		3.20	1.177	35
UF - Lab Tool	3.72	0.972	42		3.60	0.949	40

Adventure Learning: Educational, social, and technological affordances for collaborative hybrid distance education

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Abstract

Adventure learning (AL) is a hybrid distance education approach that provides students with opportunities to explore real-world issues through authentic learning experiences within collaborative learning environments. Within hybrid environments, designers habitually attempt to replicate traditional classroom pedagogy resulting in experiences that do not support or afford meaningful collaboration and transformational learning. This paper details the educational, social, and technological affordances for the effective design, implementation, and research of AL environments, providing insights for designers and researchers of hybrid online learning.

Ms. Anderson, a 9th grade social studies teacher, was teaching her favorite lesson on the Louvre museum. One of Ms. Anderson's most exciting days was when she took her class on a "virtual fieldtrip" to visit the Louvre and understand how it has progressed from a royal fortress to the museum it is today. Ms. Anderson developed an activity for her students to visit the Louvre website and "explore" the current and past exhibits. Her students progressed through the exhibits, viewed the numerous online photo galleries, and were excited to get started. After about ten minutes, Jenna, a student in Ms. Anderson's class, raised her hand and asked, "What do we do now? Ms. Anderson replied, "This *is* the lesson."

Even with online learning growing in higher education (Lewis, Snow, Farris, & Levin, 1999) and K-12 environments (Setzer, Lewis, & Greene, 2005; Davis & Roblyer, 2005), the levels of implementation vary greatly from student to student, classroom to classroom, and district to district (Setzer, Lewis, & Greene, 2005). Ms. Anderson's use of an online resource is typical in the social studies classroom – online lesson enhancements that augment individual face-to-face lessons (Authors 1, in press). However, as Jenna's comment reveals, students do not always perceive the connection to the bigger picture – the learning outcomes. They view their time on the Internet visiting a web site as a disparate activity from the goals of the curriculum. That is, the learning activities and curriculum goals do not align - an equation that does not enhance student learning. Although these disparate activities and types of integration are common, the movement to all-inclusive online environments (Authors 1, in press), where the goals of the curriculum, pedagogy, and media are in synch, is less widespread.

An example of an all-inclusive environment is an adventure learning environment. Adventure Learning (AL) is a hybrid distance education approach that provides students with opportunities to explore real-world issues through authentic learning experiences within collaborative learning environments (Author 1, 2006). An AL curriculum and online environment provides collaborative community spaces where traditional hierarchical classroom roles are blurred and learning is transformed. AL has most recently become popular in K-12 classrooms nationally and internationally with millions of students participating online. However, in the literature, the term "adventure learning" many times gets confused with phrases such as "virtual fieldtrip" and activities where someone "exploring" is posting photos and text. This type of "adventure learning" is not "Adventure Learning" (AL), but merely a slideshow of their activities. The learning environment may not have any curricular and/or social goals, and if it does, the environment design many times does not support these objectives. AL, on the other hand, is designed so that both teachers and students understand that their online and curriculum activities are in synch and supportive of the curricular goals. In AL environments, there are no disparate activities as the design considers the educational, social, and technological affordances (Kirschner, Strijbos, Kreijns, & Beers, 2004); in other words, the artifacts of the learning environment encourage and support the instructional goals, social interactions, collaborative efforts, and ultimately learning.

In this paper, we detail the educational, social, and technological affordances of AL environments. An understanding of such artifacts will enable teachers, teachers/designers, and teacher/adventurers to effectively design, implement, and research AL environments. Our paper follows an incremental level of complexity. We first examine the meaning of Adventure Learning and introduce the concept of affordances. Next, we examine the educational, social, and technological affordances of AL, and propose the use of established methodological frameworks for the effective investigation of AL environments. We conclude by looking into what the future holds for AL.

What is Adventure Learning?

Adventure Learning (AL), a hybrid distance education approach, provides students and teachers with the opportunity to learn about authentic curricular content areas while interacting with adventurers, students, and content experts at various locations throughout the world within an online learning environment (Author 1, 2006). AL is grounded in two major theoretical approaches to learning - experiential and inquiry-based learning. As Kolb (1984) noted, in experiential learning, a learner creates meaning from direct experiences and reflections. Such is the goal of AL within the classroom. Additionally, AL affords learners a real-time authentic online learning experience concurrently as they study the AL curriculum. AL is also grounded in an inquiry-based approach to learning where learners are pursuing answers to questions they have posed rather than focusing on memorizing and regurgitating isolated, irrelevant facts. Both the curriculum and the online classroom are developed to foster students' abilities to inquire via "identifying and posing questions, designing and conducting investigations, analyzing data and evidence, using models and explanations, and communicating findings" (Keys and Bryan, 2001, p 121). Since Dewey (1938), numerous learning theorists have argued for the importance of providing education that involves students in authentic or real-world experiences in which they engage in dialogue, take action, and reflect on possible outcomes (Kolb 1984; Rogers 1969). The union of experiential and inquiry-based learning is the foundation of AL, guiding and supporting authentic learning endeavors.

Based on these theoretical foundations, the design of the adventure learning experiences follows seven interdependent principles that further operationalize AL (Figure 1).

- a researched curriculum grounded in inquiry;
- collaboration and interaction opportunities between students, experts, peers, and content;
- utilization of the Internet for curriculum and learning environment delivery;
- enhancement of curriculum with media and text from the field delivered in a timely manner;
- synched learning opportunities with the AL curriculum;
- pedagogical guidelines of the curriculum and the online learning environment; and
- adventure-based education. (Author 1, 2006)

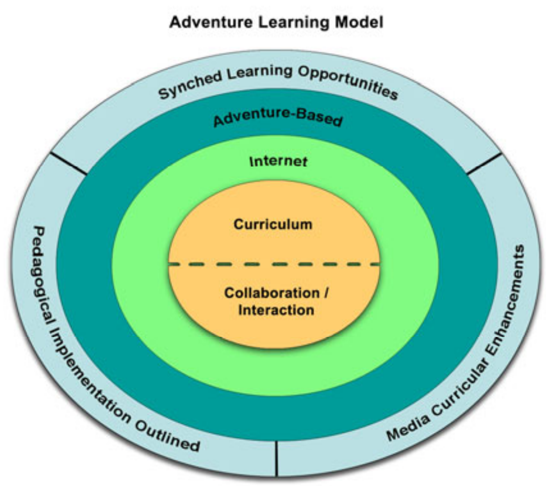

Figure 1. Adventure learning model

Some examples of AL programs are the online education programs delivered at the University of Minnesota since 2004. These programs include Arctic Transect 2004: An Educational Exploration of Nunavut (http://www.polarhusky.com/2004); and the latest circumpolar GoNorth! AL series - GoNorth!: Arctic National Wildlife Refuge 2006 (http://www.polarhusky.com/2006) and GoNorth!: Chukotka, Russia 2007 (http://www.polarhusky.com/2007). In all of these programs, adventurers and educators dogsled throughout the Arctic location of study/exploration as learners around the world collaborate and learn about the region of travel and the supportive content-based curriculum. Upon identifying the region of travel and the issues to be investigated, an inquiry-based curriculum and online learning environment is designed, developed, and delivered accordingly. For example, in preparing for Arctic Transect 2004 (AT2004), the development of the curriculum and online learning environment focused on the region of travel, the newest territory in Canada – Nunavut, and the seven Native communities the AL team would interact with during the six-month exploration. The curriculum consisted of ten modules that were written based on three levels of curricular activities – experience, explore, and expand.

Parallel to the development of the curriculum, the online learning environment was designed to support the curricular goals through the development of several online spaces. These spaces afford collaboration among learners, interaction with real-time authentic media from the field (i.e. the location of travel), delivery of authentic media that supports the curricular learning, and an overview of pedagogical principles and support for successful teaching of AL (Author 1, 2006). Examples of the seamless connection between the curriculum and the online learning environment are the online learning environment's weekly trail updates. Every Friday during the live program an "education day" is taken in the field where the adventurers and educators stop traveling as the trail report is written and the various media that were collected during the week are downloaded, edited, and sent to education basecamp via satellite technologies. The basecamp manager then makes the trail report available via the web site by Monday at 8 AM CST. The trail report wholly supports the curricular goals. For instance, if a curricular unit is focusing on climate, all photos, movies, QuickTime virtual reality (QTVR) files, interviews, and trail reports, reinforce the climate lessons. At the same time, the education basecamp manager is updating the online learning environment content, scheduling the expert speaker for the week, moderating the collaboration zones where students from around the world are posting project files, and answering all questions from students and teachers to support learning and integration respectively – with all actions scaffolding the relevant curricular unit. In essence, the curriculum units, media, and interactions between the actors engaged in learning (i.e. learners, teachers, explorers, and experts) support the curricular goals of the AL environment. In the following sections, we exemplify the ways we view this support by providing an overview of affordances.

Affordances: A Call for Action

As Learning Technologists[1], we are experiencing a tension in the field between *what* we understand about learners and *how* we design technology-based environments that afford learning (Gaver, 1991; Kirschner et al., 2004). In other words, our understanding of prospective learners' needs and abilities seldom reflects our awareness of the capabilities and limitations that technologies offer for instructional design. Institutions tend to develop, implement, and research computer supported collaborative learning (CSCL) environments and online hybrid learning environments with a focus on the surface-level characteristics of the pedagogical and technological foundations of the environment (e.g., identifying optimal group sizes, performing comparative media studies, etc.). These approaches often result in disappointed students and instructors, diminished motivation, wasted efforts and resources, and ultimately an absence of meaningful learning (Kirschner et al., 2004). What remains are merely "showcase environments" (p.48) that simulate traditional face-to-face communication and collaboration through little more than computer-assisted page turning, media galleries, and embedded chat boxes. As a result of past approaches, we must focus our efforts not only on the technological prerequisites for meaningful collaboration, but also on the educational and social conditions that fuel the nature of this interaction and experience.

When designing an online collaborative learning environment, the selection and implementation of an appropriate pedagogy supportive of the instructional aims of the project, taking into account the characteristics of the selected media, is the primary concern (Kirschner et al., 2004). The social characteristics of the design must enrich the chosen pedagogy by providing engaging opportunities that encourage the social dynamics and collaborative interactions which exist habitually in traditional face-to-face learning (e.g., group formation, learner-learner and learner-instructor communication, generative problem-solving, etc.). Likewise, the technological foundation and design of the environment must not only allow for these social interactions to emerge, but ultimately thrive by providing an effective and efficient structure that satisfies users as they accomplish tasks and collaborate with peers in the environment. In this design scenario, Kirschner et al. (2002) refer to technology as an *affordance* for learning and education, essentially a guide for the educational and social contexts of the collaborative learning environment.

Wells (2002) illustrated affordances as ecological concepts (i.e. concerned with what an environment offers to an unconstrained perceiver) that are relational to the user and environment (Gibson, 1979). That is, affordances are those artifacts of an environment that determine if and how the environment can be used by an observer (Kirschner et al., 2004; Norman, 1988). The archetypal example of an affordance is the door handle. Certain door handles are shaped in ways that lead the observer to perceive they should be pulled, rather than pushed. In terms of affordances, the curved C-shape of certain handles affords that the handle be pulled to open the door, whereas a metal plate slightly-larger than the size of a human hand leads us to believe that the plate should be pushed for a

[1] We use the designation 'Learning Technologist' with reference to an instructional designer focused on designing *experiences*, as opposed simply to designing instructional products or processes. Instructional designers must surpass the pedagogical and technical issues of developing theory-based processes and products; only then will we as a field design truly meaningful learning experiences (Wilson, 2005).

similar interaction (Kirschner et al., 2004). These relationships between the properties of an object and the characteristics of a user are what enable particular interactions to take place (Gibson, 1979). Though these examples seem fitting for the field of product design, we will discuss how affordances impact education and, more specifically, provide a real-world example of how they can be used to influence the design of an AL online learning environments.

Although instructional designers are intent to design and develop digital learning environments in which the media and interactions are self-evident to learners and instructors (i.e. the design of the software makes it *immediately* clear to users how they can interact with and manipulate the environment), artifacts in the environment are often perceived or used quite differently than the designers original intention (Krippendorf, 1989). For example, recent research suggests that conversational pedagogical agents (i.e. anthropomorphic characters used for instructional purposes) are sometimes used by learners for entertainment purposes (e.g., casual dialogue, irrelevant and inappropriate questions, etc.) rather than to support learning and instruction (Authors 2, in press). The discrepancy between a learner's use (or, in this case, misuse) of an artifact and the anticipated instructional interaction is often attributed to a weak design and implementation of appropriate educational, social, and technological affordances (Kirschner et al., 2004).

The *educational affordances* of an online collaborative environment are those characteristics of the design that determine if and how learners exhibit a particular learning behavior within the given instructional context (Gibson, 1979; Kirschner et al., 2004; Norman, 1988). In other words, educational affordances are the properties and features of the environment that stimulate, engage, and maintain collaboration amongst users and encourage learners to interact with the instructional content in meaningful ways aligned with the chosen pedagogy. For example, when learners in the AL environment explore the weekly trail report (i.e. an interactive journal of photographs, movies, narratives, and rich descriptions from the weekly experiences on the trail during the week), they are presented with a number of supportive activities (e.g., collaboration zones, weekly chats, quizzes, Q&A, explorer chats, etc.) that not only build upon the current expedition events and topics, but also encourage learners to explore these issues in their local surroundings. The embedded educational affordances guide and scaffold the learner to interact with the environment, make use of the instructional media, and collaborate with online peers in a manner aligned with the AL model.

Social affordances are defined as the characteristics of an online collaborative environment that "act as social-contextual facilitators relevant for the learner's social interaction" (Kreijns, Kirschner, & Jochems, 2002, p.13). Accordingly, tools and objects in digital learning environments that posses these social-contextual properties are called *social affordance devices*. Social affordances are a major facet of AL, encouraging collaboration at multiple levels. For example, during each week of the AL expedition, per the curriculum, students are encouraged to participate in collaboration zones by submitting observations and creative work (e.g., drawings, riddles, essays, presentations, songs, etc.) to share and discuss with other learners, teachers, and experts (both synchronously and asynchronously) (Author 1, 2006). These collaboration zones are social affordance devices of the AL environment that promote learners to engage in activities that support the social-contextual properties and goals of the AL model (Kirschner et al., 2004). Collaborative learning environments devoid of social affordances are "likely to isolate learners from their peers" (p.51), ultimately rendering the environment little more than a simple repository of instructional content and media. On the contrary, AL environments allow and encourage millions of students throughout the world to seamlessly collaborate online, an affordance that significantly impacts learning and motivation (Author 2, in press).

Analogous to the social affordances of an AL environment are the *technological affordances*, or those properties of the environment that are concerned with the efficient and effective accomplishment of tasks that satisfy the user's instructional intentions (Kirschner et al., 2004). Norman (2004) identifies technological affordances as the *usability* of an environment. Successful AL environments must not only be highly usable in design, but must also be structurally sound systems that are scalable to an influx in use. AL designers must strive to make these properties transparent to the users' interactions with the environment. An online learning environment rich with educational and social functionalities is useless to teachers and learners if the usability aspect of the design was disregarded or overlooked by designers (Kirschner et al., 2004). In other words, the technological affordances of the environment must support the educational and social interactions. Sound usability guidelines, clear design layouts, and consistent navigation themes throughout an environment are a necessity as the dynamic nature and magnitude of the media content evolves and becomes more sophisticated over the progression of an AL program. Paired with sound educational and social functionalities, efficient usability and appropriate technological affordances collectively determine the usefulness of a hybrid distance education environment (Kirschner et al., 2004).

The quality and effectiveness of collaborative distance education is contingent upon the "design of, and student's engagement in, the learning environment" (Duffy & Kirkley, 2004,

p. 4). Kirschner et al. (2004) suggest that the use of appropriately designed and implemented educational, social, and technological affordances is the foundation for stimulating, engaging, and maintaining collaboration amongst learners. Accordingly, AL makes use of anchor-based, collaborative, and situated pedagogies (educational) between students, teachers, experts, and adventurers (social) using the Internet as a means for efficient and useful collaboration (technological). A shortcoming in any of these areas will result in an environment with minimal learning, interaction, and collaboration; in effect, a mere online journal of a person's desire to explore the earth with education as the final phase of development (Author 1, 2006). It is important to note at this point that affordances are not simply tools or objects that can be developed as independent components for implementation into any digital collaborative learning environment (Kirschner et al., 2004). Rather, designers, teachers, and researchers of AL environments must understand and embrace the relationship between users and artifacts (i.e. devices) that exhibit the aforementioned educational, social, and technological characteristics.

Affordances of Adventure Learning

In the following sections we describe the design and implementation of three internationally-acclaimed AL environments - Arctic Transect 2004, GoNorth!: Arctic National Wildlife Refuge 2006, and GoNorth!: Chukotka 2007, by providing examples and recommendations of three prerequisites for effective collaboration in AL environments: (a) educational, (b) social, and (c) technological affordances.

Educational affordances of Adventure Learning

Educational affordances are those characteristics that determine if and how effective learning takes place (Gibson, 1979; Kirschner et al., 2004; Norman, 1988). Within Adventure Learning (AL), these affordances are vital to the success of learners' experiences becoming transformational (Author, 2006). The path to transformation begins with the affordance of the *AL curriculum*, the heart of adventure learning. The curriculum is what sets AL apart from an adventurer's blog. That is, the online environment and project goals support the curricular goals. As noted earlier, the curriculum is written with three levels of activities - experience, explore, and expand. The words *experience*, *explore*, and *expand* ultimately coincide with the level of complexity in a particular lesson within the module. For example, experience activities introduce students to basic ideas or concepts. These lessons create awareness of a topic or issue. In some instances, students form questions that can be answered in the *explore* or *expand* lessons. *Explore* activities use experience related ideas and increase the scale in which they are viewed. Students are required to demonstrate an understanding of a topic as it relates to new systems and larger perspectives. An *experience* activity may introduce students to a particular plant or animal whereas an *explore* activity would look at population dynamics, predator/prey interactions, or habitat distribution within an ecosystem. *Expand* activities take ideas or concepts and relate them to new situations. Students are required to use their previous knowledge and skills to predict, project, manage, relate, or solve a particular question or problem. *Expand* activities most often involve inquiry-based methodology, cross-curricular research, and real-world applications.

Each module also has two major sections – one section that focuses on the Native culture, perspective, and region of travel and a section that focuses on the Western perspective. This curricular design affords the opportunity to compare and contrast the curricular content across cultures while integrating the curriculum according to the type of learners. Furthermore, the curriculum is written to encourage the learner to use the online resources while also collaborating with peers and experts around the world. For example, as learners investigate the impact of climate change on Native cultures within a module, they are also encouraged to participate in the weekly expert chat with a climatologist from the Weather Channel™, post project files they create within the collaboration zone, ask questions to the adventurers/educators in the field, read the trail reports, view the media of the week, and participate in the online games within the online learning environment. All facets of the program are designed and developed within the curriculum and support each other. There are no disparate activities that do not relate to the curricular goals. Thus, learners are encouraged and motivated by the design of the AL program to meet these curricular goals.

The second educational affordance, *adventure-based,* motivates learners and teachers to become and stay involved in the real-time story that is unfolding. Simply, what is "normal" and boring to one individual is many times unknown and motivating to another. Thus, as the team travels throughout the Arctic delivering the story, students and teachers have the opportunity to experience and live the story virtually. From traveling to the northern-most regions of Canada, Alaska, and Russia, to exploring a local town or river, the idea of an adventure motivates. Moreover, although it may sound simple, when the adventure involves something that everyone can relate to – dogs – the motivation for curricular investigation grows exponentially (Author 2, in press). Students across the world "adopt" their favorite sled dogs and their dog is the hook to bring them to the online learning environment in school and at home almost on a daily basis. Students are motivated to return to the online learning environment where they are going to read about the updated weekly trail report and the latest adventures of their adopted dog. For example, Authors 3 (2007) found that learners repeatedly returned to the AL online learning environment after school and during the weekends to see “what the team and the dogs have gone through recently” and also to showcase what they “were working on in school” to their parents/guardians at home.

The third educational affordance is the *synched learning opportunities*. All facets of the AL design have the curricular goals and social opportunities in mind. Within an AL program, the weekly trail updates from the field, the weekly media updates (e.g., photos, movies, QTVR, etc.), the local case studies, the weekly online chats, the weekly driving questions within the collaboration zones, and the weekly quizzes are all synched with the curriculum. Learners are able to receive the scaffolding and reinforcement from the design so their personal investigations into the curricular outcomes become transformational. Authors 3 (2007) found that students investigated a curricular goal (i.e. understanding the impact of climate change on native cultures) in five separate locations within the AL program 80% or more of the time. For example, students studying climate change (1) discussed the impact of climate change with their teacher and fellow students, (2) posted project files that related to climate change, (3) discussed climate change in the weekly chats, (4) played online games related to climate change, (5) read the weekly trail report about climate change, and (6) watched the weekly media that consisted of interviews with Natives about climate change.

Social affordances of Adventure Learning

Adventure Learning social affordances are those characteristics that are instrumental in determining if and how social collaboration and interaction within the project take place. Within the AL model, residing next to the curriculum is collaboration and interaction. AL cannot be successful at a transformational level unless there is successful interaction and collaboration at multiple levels—between students and teachers; between students and subject matter experts; between teachers and subject matter experts; between students, teachers, subject matter experts, and the AL content; and lastly, between students themselves, teachers themselves, and between the subject matter experts (Figure 2). The layers of interaction and collaboration occur within the social affordance devices within the project. These devices include “Collaboration Zones,” “Expert Chat” zones, “Question and Answer” (Q&A) zones, “Ask the Team” zones, and “Send-a-Note” zones.

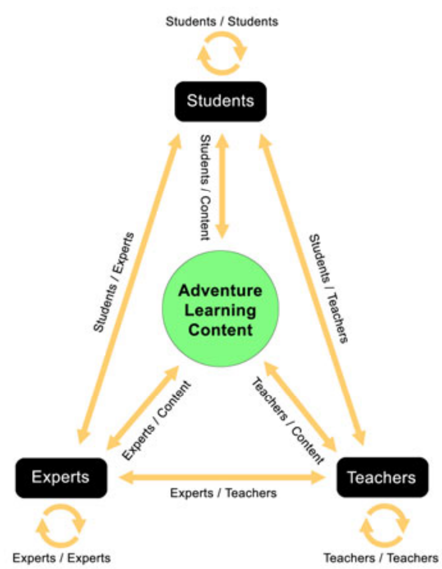

Figure 2. Adventure learning interaction model

The collaboration zones, unique to each curricular unit, are socially-designed spaces within the online learning environment that afford learners from around the world to post and view AL project files created within the curriculum. For example, a learner who creates a movie for the unit on flora and fauna will upload the file to the “Flora and Fauna” collaboration zone. Once the movie is moderated by the basecamp manager, an interactive map on the front page denotes the file has been posted and the geographical location from which the post originated. Then, from either the Observations Map or the web page navigation, learners can view and collaborate on all the collaboration zone postings. Essentially, the design of each collaboration zone is specific to the curriculum unit and the curriculum design scaffolds learners to post their project files within this environment.

Although the collaboration zones are asynchronous, other features of the learning environment such as the expert chats are synchronous and occur multiple times throughout the week to accommodate multiple time zones. On a weekly basis, an expert chat is held that supports the curricular goals. For example, if the module unit is focused on sustainability, an expert on sustainability is asked to participate in the synchronous environment fielding and answering questions from students around the world. For those learners whose questions are not answered within the expert chats, they have the opportunity to use the Q&A zone. This zone is populated with questions that learners pose to the AL team throughout the program. For those questions and words of encouragement that are more personal, learners can ask the AL team questions or send them words of encouragement within the "Ask the Team" and "Send a Note" zones.

All of these social affordance devices encourage learners to interact with the AL content and collaborate with AL participants around the world. The mixture of "professional and personal," depending on the zone that is utilized, affords the opportunity for learners to learn more about the curricular goals while also gaining insight into the AL team and the daily demands of delivering an AL project from the field. This personal look into the AL team (people and dogs) brings the learner closer to the content and the numerous participants within the program, enabling learners to engage with learning experiences that are transformational (Author, 2006).

Technological affordances of Adventure Learning

From kindergarteners to high-school students, parents to grandparents, and student-teachers to university professors, the AL environments have been used by several million visitors over the past three years (Author 1, 2006). This feat, due in large part to an expansive curriculum supported by engaging social affordance devices, was attainable through an efficient online design grounded in user-centered research and successful technological affordances. The technological affordances of an AL environment are (1) designed to ensure a highly-usable experience for children and adult users alike, (2) scalable to an influx of both media (e.g., trail reports, photos, videos, collaboration activities, etc.) and users over the course of AL project, and (3) use technology to enhance and guide user interactions within the environment, avoiding the use of technology for technology's sake (Kirschner et al., 2004; Norman 2004). Between 2003 and 2004, the Arctic Transect environment endured a surge of visitors as user statistics escalated from figures in the thousands to records in the millions, with users from nearly every country following the expeditions and participating in the collaboration zones. Usability and scalability played a key role in this scenario. Had the online environment become a cluttered depository of unorganized expedition media and poorly managed navigation, the environment, and more importantly the AL project as a whole, would have failed.

Parallel to the development of usable and scalable AL online environments, it is imperative that AL designers select and implement technologies that support and advance the instructional aims of the project, rather than simply piecing together a concoction of off-the-shelf technologies that provide interactions similar to the social affordance devices discussed above. The selection, design, and implementation of technologies must not ignore the human side of the AL environment, that is, the students and teachers who will be exploring the online media and interacting with others in the collaboration zones (Kirschner et al., 2004). For example, the Observations Map (located on the overview page of each Collaboration Zone) uses technologies powered by Google Maps™ to provide a visual placemark that denotes the geographic origin of each interaction. The visualization technology implemented in the Observations Map not only provides learners with an easy-to-use reference and navigation of current Collaboration Zone posts, but more importantly helps learners discover and understand the foundation of authentic global collaboration – the collective generation of knowledge across cultural and geographic barriers.

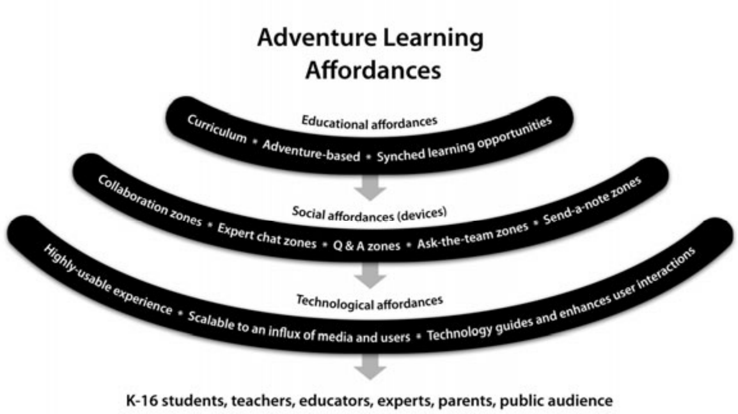

Figure 3. Educational, social, and technological AL affordances

Adventure Learning affordances: Summary

The thoughtful implementation of educational, social, and technological affordances in an AL online environment is a critical component of the AL design process (Figure 3). Engaging a wide audience of teachers and learners in a collaborative effort to explore an authentic context can be a complex instructional task. Thus, the use of sound technological affordances to mediate the social and educational interactions of users in an AL environment is an important framework for designers, teachers, and researchers. As more AL projects begin to surface in the distance education community, we encourage researchers to explore the intricate nature of these learning experiences through multi-methodological and multi-paradigmatic examination. The following section presents an overview of three such research endeavors.

Exploring the affordances of AL environments

Theoretical propositions regarding learning and teaching need to be empirically examined as to their applicability, viability, effectiveness, and efficiency. To investigate the educational, social, and technological affordances of AL environments, we propose the use of three established frameworks that inform each other in terms of the type of knowledge they generate. These three are (a) traditional performance and evaluation studies, (b) phenomenological investigations, and (c) design-based research explorations. In the sections that follow, we explain each framework with respect to AL and present an example of a research study we have conducted to illuminate the results that each approach may yield. It is important to note that the evaluation of the affordances of AL environments should not be limited by philosophical arguments of the type of knowledge generated by different methodological approaches. Each approach complements the other two and, in conjunction, these methodologies can provide a more holistic picture of AL environments with respect to variables of interest.

Traditional performance and evaluation studies

By traditional performance and evaluation studies we refer to research that falls under the umbrella of the experimental, quasi-experimental, and qualitative case study approach that examines aspects of AL in relation to teaching and learning. It is important to note that the label *traditional* should not be taken to mean that we do not value the importance of such research. On the contrary, such research endeavors can reveal relationships between variables of interest (e.g., teacher motivation, degree of AL integration, etc.), indicate new research directions, and inform researchers as to the feasibility of a theoretical construct (in this case AL).

As an example, Authors 4 (2007) examined one aspect of the social affordances of AL – specifically, how student motivation relates to (a) student and teacher characteristics, and (b) the ways in which the AT 2004 program was used within the classroom. Results from a factor analysis approach indicated that students were motivated by interacting with the media such as photos, videos, and audio updates (social affordance devices); reading about the dogs, explorers' progress, and the Inuit communities; and using the learning activities from the AT 2004 curriculum. Additionally, a structural equation model indicated that (a) teachers employing a traditional teaching pedagogy utilized AL less often than those teachers with a more constructivist teaching style, (b) AL activities significantly impacted student motivation, and (c) teaching style did not impact student motivation. Overall, the model suggests that constructivist teachers influence students' motivation in relation to AL purely through how strongly they implement the AL program within their classroom.

Phenomenological investigations

Even though the use of the phenomenological method is not popular in educational technology circles, we hold that it is of utmost importance in understanding the authentic and contextual experiences of teachers, learners, and designers. Phenomenology is an interpretive research methodology rooted in psychological inquiry aiming to examine, understand, and interpret observable, yet special events in our everyday life (Heidegger, 1962).

For example, Authors (under review) wrote a hermeneutic phenomenological manuscript describing the experiences of an educator/designer/adventurer when delivering AL from the Arctic. One of the constituents of this experience is the continuous struggle and frustrations with the technology used to deliver education from the Arctic to the rest of the world, a struggle to maintain the technological affordances of the environment to enhance the social affordances of the AL program. The adventurer notes, " *So, for three or four hours, I will be working on trying to get 2 Megs sent out. I'm getting frustrated. I'm getting very frustrated. I'm getting mad at the technology. I'm getting really tired. It's now midnight. I know I have to get up the next morning to get back on the trail again."* We are often presented with convoluted ideals about technology: Technology is simple. Technology will make things better. Technology will make life better. Even though these statements may be true, they may hold accurate only in the environments from where they were birthed: businesses, homes, cities, coffee shops, etc. In the Arctic, connecting with the satellite to send a mere 2 or 3 Megs of photos "meant a day of fighting the technology to try to write up the report." Technology wasn't so simple. "*We would position ourselves in a way that had a clear bearing to the southeast. If we had sea ice in the way, we knew we wouldn't be able to transmit the report. You jump back in* *and fight with the server because you will connect, but it won't transmit data."* The adventurer endured a great deal every week just to shape the data into a manageable form and was rarely compensated by the acknowledgement that his data was actually going somewhere. It was as if he was "*throwing bottled notes into the Arctic Sea, hoping they would somehow find their way south around Maine, along the costal Atlantic, around Florida, and zigzag their way up the Mississippi river to the University to get published for the world to consume*."

Design-Based Research

Design-Based Research (DBR) is a relatively new research methodology that aims to assist in truly understanding learning in context (Brown, 1992; Collins, 1992). In short, DBR attempts to understand the "how" while valuing ecological validity and exploration in the messy educational contexts of the classroom and the distance learning environment. For example, we could ask, how do the educational and social affordances inherent in AL environments influence the outcomes of interest? DBR is concerned with solving real-world problems by interventions (Wang & Hannafin, 2005) that modify the educational, social, and technological affordances of AL endeavors. More formally, DBR is a multi-step methodological approach aimed at enhancing learning and teaching processes by means of theory development, research in authentic and naturalistic environments, and the sharing of knowledge amongst practitioners and researchers (The Design-Based Research Collective, 2003). Phenomena are studied in their "messy contexts," outside of convoluted labs (Brown, 1992) because any insights gained from investigations undertaken in out-of-context environments have limited applicability in the classroom. As such, DBR affords us the opportunity to experiment with interventions in authentic environments to explore what happens in the "real world." In line with these ideas, Collins (1992) noted that we need to methodically investigate variants of an intervention to accurately capture their influence. For instance, we could explore social affordances in the context of varying degrees of collaboration between students and teachers. Such an endeavor requires an understanding of the complexities of the environment in which learning occurs (e.g., for a description of school culture and its intricacies see Firestone and Louis, 1999), especially in the face of dominant cultural beliefs about learning and teaching that may prevent change (Cuban, 1993; Lortie, 1975).

As evidenced by our proposal to investigate the affordances of AL environments with respect to varying and complementary research methodologies, we are in support of a multi-paradigmatic approach to research that may inform different facets of AL theory, programs, curricula, and learner/teacher experiences. Equally important, we perceive the use of the DBR framework as a valuable tool to guide us towards systematic approaches to designing interventions and examining ecologically valid learning and teaching processes. Finally, as DBR emphasizes the sharing of knowledge between researchers and practitioners, collaborating with teachers and immersing ourselves in contextual and authentic environments, may allow us to better comprehend what AL in the classroom affords.

Exploring Adventure Learning affordances: Summary

To understand phenomena of interest, researchers need to engage in *systematic* research endeavors. To be useful, such endeavors need to be multi-methodological and multi-paradigmatic, being able to inform each other in terms of the knowledge they generate. Additionally, such research needs to be based on solid theoretical grounds – nevertheless we must be prepared to amend such theories should such a change be warranted by the results of our research endeavors. The investigation of the educational, social and technological affordances of AL environments not only warrants, but demands, the use of theory-based multi-methodological and multi-paradigmatic research endeavors.

Conclusion

In this paper we discussed how the design of adventure learning addresses the educational, social, and technological affordances (Kirschner et al., 2004) needed for successful collaborative online learning. As the success stories of AL in the K-12 classroom are increasing, we can identify what is working and apply it to other online hybrid distance education programs while studying their effectiveness per the discussed research approaches. Although the design, development, and delivery of the described AL programs represents an elite approach where success is based on large amounts of funding, we must now use what we are learning and make it sustainable for all educators. The future of AL begins with educators learning to design and deliver their own AL programs while taking into account all AL affordances. AL does not need to be an elite form of developing learning opportunities where the region of travel is as remote as the Arctic. Rather, AL can be a class investigation to study an issue/problem within learners' own locale using the principles and affordances of AL, leading to meaningful and transformational learning.

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How can technology help bridge the cultural divide?
A look at enterprise learning technology and its role in global business

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Introduction

The globalization of business is an inescapable progression. In this modern technological era, global business is no longer limited to large multinational corporations. Thanks to the communications revolution enabled by the Internet, even small businesses can look beyond their local clientele to the global marketplace. As call centers are located across the globe from central management and production factories are situated on separate continents than a product's clients, the need for intercultural communication and sensitivity has grown exponentially.

The corporate trainer has a unique role within this expanding marketplace. Enterprise training departments are now required to provide training for vendors, clients, branches, factories, and other business operations across the globe. With the necessity of ensuring the delivery of global standards as well as preserving the unique cultural features of diverse populations, trainers must look to the efficiency and effectiveness of technology. The flexibility and ubiquity of technology provides a unique method to both ensure cultural specificity as well as control globally delivered content through sophisticated training systems. The goal of this paper is to investigate how enterprise learning technology can assist in bridging the cultural divide in the corporate training environment.

Globalization and the Cultural Divide

Several factors have accelerated globalization in the business world: from international trade agreements to reduction of overhead through outsourcing; from instantaneous global communication and financial networks to the increase of immigration (Thomas & Inkson, 2004, p. 7). Global business is growing. "Globalization means an increase in the permeability of traditional boundaries, including those around countries, economies, industries and organizations" (Thomas & Inkson, 2004, p. 6). Although boundaries of time and space can be seamlessly ignored in global business, intercultural communication has the potential to make or break businesses. "Unlike legal, political, or economic aspects of the business environment, which are observable, culture is largely invisible. Therefore, it is the aspect of global business that is the most overlooked" (Thomas & Inkson, 2004, p. 8).

What is the cultural divide?

While defining 'culture' can be difficult, the cultural divide is a simpler concept. Considering the complexity of what constitutes culture, a broad but necessary definition is "the way of life for an entire society" (D. Jary & Jary, 1991, p. 101). This can include, but is not limited to, language, dialects, patterns of speech, food, sports, values, clothing, concepts of authority, art, social hierarchies, religion, mannerisms, beliefs and politics. Culture is a broad sweeping idea that can represent any unique element that defines a society. It is a distinguishing measure to separate one society from another.

Culture can be implicit and explicit as seen in the metaphor as culture as an onion (Spencer-Oatey, n.d., p. 3-4). In descending order from explicit elements to implicit elements, culture can be defined as artifacts & products, rituals & behaviour, systems & institutions, beliefs, attitudes & conventions, and basic assumptions and values (Spencer-Oatey, n.d., p. 4). "Culture shapes the cognitive schemas which ascribe meaning and values to motivational variables and guide our choices, commitments, and standards of behavior" (Erez, 1994, p. 13). Culture is a part of who we are and is evident in every social interaction, whether within or outside of our own societies.

The cultural divide refers to the meeting of different cultural elements and the differences between them. How well or poorly one is able to understand and accept the differences between one's own culture and others defines how well one can bridge the cultural divide. Regardless of how well versed or educated a person is in another culture, miscommunications, misunderstandings and blunders are a commonality.

Why do we need to bridge the divide?

From call centers to industrial manufacturing, from medical equipment production to technology design centers, corporate training departments now have to deliver core business competencies and values to people anywhere in the world. Considering cultural diversity in the development and delivery of training is not only an ethical requirement of the job, but also a professional necessity. Fostering and valuing a multicultural community is one of the key ethical values cited by both the American Educational Research Association (AERA) and the Association for Educational Communications and Technology (AECT). The AERA code of ethics states that "[r]esearchers have a responsibility to be mindful of cultural, religious, gender, and other significant differences within the research population in the planning, conduct, and reporting of their research" (AERA, n.d.) and the AECT code of ethics states that its members "[s]hall seek to encourage the development of programs and media that emphasize the diversity of our society as a multi-cultural community" (AECT, n.d.).

Cultural barriers can have a significant impact not only on how training is received and validated by a learner, but on the overall reputation and future productivity of a corporate training department. It is common business sense to understand that business success in any culture is dependent upon variables such as trust, respect and confidence. These concepts are cultural constructs. In order to be successful, a business must communicate these values to a client in a manner that ensures cultural understanding and acceptance. Understanding and communicating with other cultures is as important in business as understanding other languages.

Bridging the cultural divide in corporate training can be as basic as ensuring that training is communicating the appropriate message and information to the learner. Mistranslation of content can cause significant misunderstandings due to either inappropriate word choice or diffusion of the overall message of the content. If learning technology is not culturally flexible, there can be large consequences for the success of a training program: training dates may be incorrectly stated to a learner, times of sessions may be confused, etc. Inappropriate content, confusing design and inaccessible materials can cause a learner to loose trust in a product. And once trust is lost, it is difficult to regain (Karvonen, Cardholm, & Karlsson, 2000, p. 4). Ensuring the success of a delivered training program to multiple cultures is far more complex than simply translating content.

In 2002, Thomas, Mitchell and Joseph proposed altering the standard training development cycle, ADDIE (i.e. Analysis, Design, Development, Implementation, Evaluation), to include a cultural dimension (Sieffert, 2006, p. 9). This 'third dimension' of ADDIE would include the values of intention, interaction and introspection. Instructional designers must approach their projects "in a manner that is culturally sensitive and grounded in the notion that culture is inescapable" (Sieffert, 2006, p. 9). Once the intention of cultural sensitivity is grasped, Thomas, Mitchell and Joseph propose that instructional designers must interact with the target audience of the product to ensure cultural appropriateness. And lastly, "[d]esigners must examine their own values and beliefs to ensure that they are not unintentionally including them in their design (Sieffert, 2006, p. 9).

Enterprise Training Technology and Culture

When training managers are located continents away from where they are responsible for delivering training, how can they manage the cultural requirements of doing business overseas effectively and efficiently? In comparison with other professions using instructional technology (e.g. K-12 and higher education), enterprise training departments most often utilize advanced technology to manage and deliver their training. Learning management systems (LMS's) and eLearning are technologies used extensively in enterprise learning. These technologies have the potential to bridge the cultural divide for enterprise training departments. This section identifies elements of LMS and eLearning technology that are at risk for being culturally exclusive. These lists are in no way comprehensive. Many other elements of enterprise learning technology can impact cultural acceptance of learning. These lists were complied to serve as an introduction to the types of elements that can be used to bridge the cultural divide.

Key Technology 1: Learning Management Systems

Learning Management Systems are software solutions used for the administration, delivery and reporting of learning activities. LMS's are used by a wide variety of organizations such as higher education, k-12 education, small and large private businesses in all industries and the government. These organizations use LMS's to deliver eLearning, manage the enrollment and training delivery process, administer and assign training, and track and report training delivered not only through the LMS, but also face-to-face and blended learning solutions. LMS's are highly flexible in design and functionality and can include features such as assessment and testing, evaluation, certification management, ERP/CRM integration, learner and manager self-service, knowledge management, competency management, performance management, content authoring and logistics management.

Learning Management Systems have many features that are specific to the culture in which they were developed. Considering that the business of enterprise learning revolves around concepts such as scheduling, content delivery and communication, culture permeates the very design of these technologies. However, LMS's can be designed or configured to take intercultural differences into account. A review of key considerations for cultural specificity is provided below:

Table 1: Cultural Specificity in Learning Management Systems

Salutation	The very first thing a learner sees when they log into a LMS is a greeting with their name, informing them that the systems recognizes them as a learner and will be tracking their learning progress correspondingly. However, name construction and configuration is very different around the globe. Many cultures order the family name before the individual name, and the terms "first name" and "last name" may not be recognized. LMS's should be able to display a preferred name or nickname since some Asian cultures also have a westernized individual name. The system should be able to clearly differentiate between multiple names, as are found commonly in Spanish family names. Integration with the eLearning standard, SCORM, can also be culturally dependent since the SCORM standard requires the transfer and communication of a learner's full name, which can conflict with the cultural use of single or multiple names.
Language	Different languages have unique formatting requirements. Do not forget that many languages are read from right to left, while other languages are read left to right. This reading order can impact not only the screen design and layout of a LMS interface, but also how intuitive it is for each learner to determine where to go to complete a task within the interface. Automatic language detection is a critical part of ensuring cultural flexibility.
Course Catalog	Course offerings should be displayed to the learner within a LMS dependent upon their location, language and business area. Filtering course catalogs can be difficult to implement due to different preferred languages within a region. The commonality of expatriates causes difficulties for LMS's because they require constant integration with HR systems to determine the accurate location and language preferences for employees on short-term and long-term assignments.
Scheduling	A main function of a LMS is to manage scheduling of synchronous training. The LMS must ensure that time and dates are displayed in the appropriate formats, such as MM/DD/YYYY for the United States. ISO Format of YYYY-MM-DD may not be recognized by some cultures. Times are also displayed in either 24-hour format or 12 hour format with AM/PM designators. Time zones are very difficult elements to integrate into scheduling due to the differences with daylight savings shifts across the world and countries or states where daylight savings is not taken into consideration.
Communications	A critical feature of a LMS is its communication systems. Emails can be sent to a learner reminding them of an upcoming training course or deadline, inviting them to participate in a course, reporting on their completion, communicating pre-course materials, etc. The first aspect of LMS communication is the author. It is important to consider whom an email comes from in context of it's content. If an email is demanding a completion of overdue required work, then an email from a

	disembodied global address is less like to be given as much attention as one sent from a global head of training, or the head of one's own division. Authority is a cultural aspect that relates to concepts of power distance between subordinates and authority figure (Thomas & Inkson, 2004, p. 34). Ensuring that the appropriate authority communicates important messages will greatly impact the way the messages are received. Emails should be sent in the appropriate languages that learners require. While some email systems are incompatible with formatting and styles, be aware of cultural meaning in color (see eLearning section below). The content defined for each LMS communication email template should be flexible in order to be customized to take advantage of cultural differences in communication. For instance, American workers require clear and precise communication of deadlines and requirements. However, this approach would be considered blunt and improper in other cultures. The difference between inviting and requiring attendance is an enormous cultural boundary that can be managed through the words and content specified in communication from a LMS.
Grading	Grading and assessing one's performance on a learning activity is considered a required measure of completion in many cultures. However, indicating that a learner may have performed poorly or failed a particular course or test is prohibited in many cultures. For instance, the German Worker's Council prohibits LMS's that are used by Germans to include any status other than "completed" or "in progress." A LMS must be flexible in its technology in order to meet such standards of terminology.
Evaluation	Course and instructor evaluations are an important part of the instructional design process. Constantly improving content requires the honest feedback of participants. However, many cultures do not prefer to provide critical feedback. It is not culturally acceptable to challenge an authority figure (Thomas & Inkson, 2004, p. 34) in many Asian and South American cultures. Instructional designers need to be careful with the wording and features such as anonymity when creating and delivering evaluations.
Deadlines	Certain cultures have high values of uncertainty avoidance, which can affect the use of LMS technology (Thomas & Inkson, 2004, p. 34). Some cultures may require structural elements such as deadlines in order to avoid confusion over expectations for completion, regardless of whether the training is mandatory or voluntary. However, some cultures will react with a natural resistance to deadlines, such as American cultures, where imposed structural constraints are seen as a barrier to productivity.
Help options	Different cultures have different expectations about the level of assistance required from owners of enterprise technology. Also, many cultures have varying levels of technical proficiency. As a result, enterprise training departments must implement the most effective help desk solutions to support their training products and learners. Factors to consider should include locally situated or globally centralized help centers, language support for call centers, multi-language help guides and walkthroughs, and local or global phone numbers for support. Each of these choices will impact the perception of a corporate training department within each culture. Some cultures require hands-on supervision training and support, where others are reticent to contact anyone for assistance. Regardless of culture, help centers must be well staffed and well trained. Universally, competence is a primary component to gaining and maintaining trust.

Key Technology 2: eLearning Courseware

The delivery of eLearning is a popular and cost-effective method for ensuring content delivery around the globe. However, as instructors normally take into account the audience of a course to ensure it's effectiveness, so must instructional designers when designing an eLearning course. The following elements of eLearning must be considered in order to avoid cultural miscommunications and misunderstandings.

Table 2: Cultural Specificity in eLearning Courseware

Color	Color has many different meanings for different cultures. For instance, red in China indicates prosperity and rebirth, but to Americans, red means stop or danger. To predominantly Christian cultures, white represents innocence and purity, but to the Japanese, white is the color of death and mourning (Hackett, n.d., p. 7-8). Before using colors, an instructional designer should research their cultural values to avoid incorrectly communicating the message of the content.
Sound	It is important to consider not only language, but vocal intonation and accents when providing narration in an eLearning course. Providing narration in English spoken by an Australian to an American audience can be confusing and can lead to poor consideration of the program. Also, sound effects may not be universal in every culture. Everyday items such as alarm clocks or ambulance sirens sound different around the world.
Images	Images are some of the most culturally exclusive elements to be included in eLearning training. Instructional designers should be aware of the cultural values associated with images of people. Clothing, race, facial expressions, physical contact, the role of women in the workplace, eye contact and hand gestures are all factors that can be grossly misinterpreted in different cultures. For instance, an image of a female boss in a modern business suit and skirt, shaking hands and making eye contact with a male subordinate worker would be insulting in many Arabian cultures. Symbols that represent values such as currency, everyday items and concepts can also be culturally specific, such as the shape of an electrical plug or a stamp for mailing letters.
Navigation	Learners from high uncertainty avoidance cultures may prefer to be guided through eLearning courses in a clear and linear style (Thomas & Inkson, 2004, p. 34). However, other cultures may react to guided and linear navigation with boredom or frustration.
Language	Although translation may be one of the most obvious methods of bridging the cultural divide, it is also a very difficult process. Translation is not only time consuming and expensive, but, depending on the content, mistranslation can be deadly. For example, a pharmaceutical company's training department translates their standard procedures for production into other languages. If simple content such as safety procedures are inappropriately translated, the company not only could face significant loss of reputation and business, but lives may also be lost. Beyond literal mistranslations, instructional designers can have a difficult time ensuring that inference and abstract messages are preserved across translations. It is important to ensure that content is translated by a native speaker in the appropriate dialect for the target culture. When writing for translation, ensure that content is formatted simply and avoid over styling text. Do not include metaphors, jokes, or slang unless the translator is able to substitute an appropriate cultural equivalent. Be aware of the way that differences in text directionality will cause learners to navigate through the course. The number of words in a sentence and the number of letters in a word are enormously different across languages and can impact how much text can appear on a screen. Be aware of the unique characteristics of the languages that the content will be translated into and design appropriately.
Laws & Authority	Every culture has different concepts of authority and different laws that instructional designers should be familiar with. What constitutes sexual harassment in France is not the same as in the United States. All instructional content should be sensitive to

	the laws and regulations of other cultures. Portrayal of authority figures should be culturally explicit to the target audience. For instance, a subordinate providing honest feedback or complaining to a boss is not an appropriate portrayal of the interaction with authority figures in Asian cultures, while it is the norm for American and many European cultures.
Text specifics	There are a large number of inherent additions to content that should be considered when developing multicultural content. These include but are not limited to units of measure, punctuation, number formatting, list separators, acronyms, abbreviations, personal titles, symbols, time zones, and date formats. If materials are available to be printed from eLearning courses, ensure that the formatting of the materials is compatible with all standard paper sizes, including A4 in European countries and Letter paper in America.
Pedagogy	Individualist and collective cultures will approach the use of eLearning in different ways and instructional designers need to be aware of the pedagogical impact of these differences. Collectivist cultures are more comfortable when relating their actions to a larger group where as in individualist cultures, the consequences of an action are considered only in relation to the self, not the group (Thomas & Inkson, 2004, p. 30). This can impact the structure of the eLearning product (blended with a synchronous group interaction component, or guided individually-paced learning). Each culture has developed a unique method of instruction and learning and many of these methods may be incompatible. For instance, constructing an eLearning scenario as a game could be considered frivolous and insulting in countries that do not value play as a part of learning. Matching cultures with pedagogical styles will ensure that learners not only accept the training, but have a better opportunity to internalize and transfer the knowledge.

It is important to be aware of the danger of surface frivolity. Including cultural elements that are unrelated to the content of the course could be perceived as insulting and flippant. Bridging the cultural divide is not as simple as replacing images with people of the correct races or ensuring that translated text can fit on a screen. It is very important to ensure that content, whether globalized or localized, is respectful of its audience.

Globalization versus Localization

Globalization experts identify a significant rift between global standardization and the need for localization. Localized products are customized to include culturally specific features, whereas globalized products have had all cultural specificity stripped away to produce globally acceptable content (Hackett, n.d., p. 2). Internationalization is the act of preparing a product to be localized and involves identifying all aspects of the product that are culturally specific in order to easily substitute local values (Hackett, n.d., p. 2).

The implications of the debate range from the negative impact that globalization can have on acceptance of products, to the overwhelming effort and time investment that internationalization and localization requires. Some state that globalization can provide a neutral and safe approach to delivering content to multicultural audiences. However, as demonstrated above, the need for cultural specificity should far outweigh the need to save the time and effort required to produce a culturally specific product. By sacrificing the unique cultural characteristics required to create a meaningful learning product for different cultures, an enterprise training department could be at significant risk of failure. Within the training development cycle for each learning product, instructional designers should follow Thomas, Mitchell and Joseph's suggestions and determine the best way for each culture to fulfill the defined learning outcomes of the product. Advocating localization will ensure the preservation of trust and attention of the enterprise learner.

Concluding Remarks

Instructional Designers and Technologists need to be aware that the technology that they develop to manage and deliver intercultural training will undoubtedly be based on their own personal cultural assumptions. It is critically important to be aware of the cultural divide and to develop and utilize technology with a strong cultural intelligence of one's audience. "Cultural intelligence involves understanding the fundamentals of intercultural interaction, developing a mindful approach to intercultural interactions, and finally building adaptive skills and a repertoire of behaviors so that one is effective in different intercultural situations" (Thomas & Inkson, 2004, p. 17).

A checklist of questions should be answered prior to beginning any project, for example: What are the cultural backgrounds of the audience for this project? Are there culturally unique or sensitive topics that will be covered in this project? Will the project be globalized for consistency or localized for specific cultural requirements? What appropriate pedagogical approaches are compatible with the target audience? Will the project need to be translated, and into what languages? Just as a proofreader approves content, a cultural proofreader should approve projects for multicultural audiences. Ensuring that content is culturally appropriate and well received will ensure success of your enterprise learning project.

Considering cultural aspects of technology in the workplace is the first step towards implementing a culturally intelligent training program. Enterprise training departments must ensure that cultural elements are included in every area of project management, design and delivery.

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Comparing Institutional Approaches to Competency-Based Distance Education

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Introduction

Competency-based education (CBE) has emerged as a powerful variation of distance higher education. As the technology of the Internet has catapulted distance learning as a widely accepted alternative to classroom-based campus education, several institutions and many programs have incorporated CBE to further enhance the adult learning experience. Distance learning enables access, as working adults can upgrade their skills and prepare for new careers through the convenience of working on their own time schedule from home or office computers. CBE enables adults who have already acquired knowledge, skills, and abilities from prior college attendance or through work and community experience, to incorporate those substantively into degree programs.

What is competency-based education? Its major premise is that diplomas and credentials should be awarded on the basis of demonstrated student performance – on outcomes and results – rather than on the accumulation of credits, the number of successful semesters completed (seat-time), and adherence to campus residency requirements. CBE is often tied directly to the occupational requirements of working professionals, requiring degree candidates to solve real-world problems of nurses, teachers, computer scientists, and business managers. CBE espouses liberal education competencies as it challenges students to effectively apply skills like critical reasoning, quantitative literacy, language, communication, the humanities, and the natural and social sciences to adult roles of citizen in a participatory democracy. CBE often defines outcomes around the standards that have already been set and are continually redefined by state and national government agencies, professional associations, and accrediting bodies as levels of knowledge, skill, abilities, and dispositions to which graduates must achieve. Not only does a CBE credential explain the students' capability to demonstrate proficiency in required areas, CBE is also attractive to employers who feel certain that CBE graduates possess the abilities to "hit the ground running" in the positions to which they are recruited or promoted.

Although virtual institutions, like Western Governors University (http://www.wgu.edu), have embraced CBE as their defining characteristic, it is more typical that CBE will be adopted by professional programs within institutions. SUNY Empire State College's competency-based MBA program is a good example of this where one degree program adopted CBE within the SUNY University System (http://www.esc.edu). DePaul University's School for New Learning (http://snl.depaul.edu), began one of the first CBE undergraduate residential programs thirty years ago, and offers both undergraduate and graduate hybrid, and distance education to local, regional and international constituencies. Degree programs based on CBE have emerged in such areas as nursing, business, information technology, education, dentistry, and engineering. Accrediting and professional associations are becoming much more concerned with the outcomes of higher education, not just the inputs of what students are taught. Higher education institutions, such as Excelsior College (https://www.excelsior.edu/) and Thomas Edison State College (http://www.tesc.edu/) don't consider themselves competency-based, yet they have high-stakes assessments where candidates demonstrate their abilities in proctored settings, leading to credits accepted at hundreds of other institutions. Similarly, credit-by-evaluation practices involving portfolio development with work samples are practiced at numerous postsecondary institutions and overseen by the Council for Adult and Experiential Learning (CAEL) which concerns itself with candidates' mastery of competence in their award of credit (http://www.cael.org/). Many CBE degrees have site-based requirements, such as the taking of assessments at proctored sites, classroom observations of candidates' teaching abilities, and residencies; however, many CBE programs, such as DePaul's and WGU's, are delivered either primarily or completely online.

Interestingly, competency-based education is not just an American phenomenon. Higher education institutions throughout the European Union are incorporating CBE within their degree programs as they comply with the central elements of the European Higher Education Area mandates: to base credits upon student workload, to have comparable degree programs, and to promote mobility and transfer from one institution to another, regardless of country (Colledo, 2007). Institutions such as the Spanish National University of Distance Education (UNED) are restructuring degree programs to incorporate assessment for prior learning and redefining courses to include required competencies (Santamaria, 2007).

Rationale for CBE

The rationale for CBE dates back to ancient apprentice programs where young workers lucky enough to be chosen would work for several years under the tutelage of a master craftsman until proficient in their professions. Educational programs also evolved from tutelage of master teachers to formal educational programs, yet there was often a separation of formal education from mastery of career competencies. "The once clearly marked distinction between teaching and training has become an increasingly permeable boundary" (Taylor, Marieneau, & Fiddler, 2000, p.xi). As careers and education have intertwined more over the last century, educational programs have begun integrating competency-based courses that assess proficiency of specific subjects for mastery of knowledge in those areas. "Starting shortly after the end of World War I, there began emerging…a growing body of notions about the unique characteristics of adults as learners….these notions evolved into a comprehensive theory of adult learning." (Knowles, 1984, p.28).

> In adult education the curriculum is built around the student's needs and interests. Every adult person finds himself in specific situations with respect to his work, his recreation, his family-life, his community-life, et cetera—situations with call for adjustments. Adult education begins at this point. Subject matter is brought into the situation, is put to work, when needed. Texts and teachers play a new and secondary role in this type of education; they must give way to the primary importance of the learners. (Lindeman, 1926; as cited in Knowles, 1984, p.29).

CBE has gained appeal for working adults because it acknowledges their life experiences and allows them opportunities to apply those experiences for college credit. This is particularly meaningful for adults who may not have been able to attend or complete college because they can now use their life experiences to demonstrate mastery in their fields of expertise. Adult learners are goal-oriented, they appreciate that CBE presents educational degree programs in a clearly-defined and organized context. Adult learners are also practical; they want to feel that returning to college is meaningful to them. Working on a degree after a number of life successes has to make sense, either for furthering their career opportunities, or for a sense of personal achievement. But adult learners often feel squeamish about embarking on a degree pursuit because their earlier college experiences may have been less than positive. They may need affirming reinforcement and ongoing interaction to bolster self esteem when returning to college. CBE helps students become more confident and proficient through engaging them and providing customized programs that take into account individual differences in competencies, in the pace of learning, and in individual learning styles. "The learning that adults do arises from the context of their lives, which is in turn intimately tied to the sociocultural setting in which they live…thus learning in adulthood is characterized by its usefulness for immediate application to the duties and responsibilities inherent in the adult roles of worker, spouse, parent, citizen, and so on." (Merriam & Cafferella, 1991, p.304). "If the meaning of an experience is not immediately evident, there is an inclination to give up and move quickly on to something else" (Taylor, Marieneau, & Fiddler, 2000, p.25). What can be so effective in CBE programs are the opportunities to take the adult learners' positive experiences and help facilitate students' transformation to mastery of learning through mentoring, dialog, positive reinforcement, provision of new opportunities for learning, and reflection.

Most CBE programs have stringent assessments that require students demonstrate their proficiency in the desired areas. Once they acquire each competency credit or unit, students continue to build on their successes towards their degree. CBE provides a safe environment where learners can scaffold new learning on their prior experiences and presents them with new educational choices and alternatives. Adults want to have the opportunity to achieve their goals, and CBE helps them by matching their level of development and self-motivation with their desired degree goals, and then provides them with an environment that nurtures and facilitates the attainment of those goals.

There has been a burgeoning of distance degree programs over the last decade because online instructional delivery allows students to study conveniently at the time and place of their choice. In addition, CBE programs also present the advantage of accelerating through a degree program for those students who may already have had a number of life experiences that can translate into competency mastery and who are willing to study to acquire new ones as quickly as their pace allows.

CBE Practices

All institutions of higher education must address similar issues, such as what degree and credential programs to offer, how to attract students that are a good fit form the institution, how to build upon what students already know and can do, how to assist students in planning their degree program and progressing through it, how to maximize their learning experience, and how to determine whether candidates have mastered the material to the level required of a graduate. In the section below we describe CBE practices in program development, marketing and recruitment, admissions, prior learning assessment, advising and academic planning, learning, and outcome assessment as they are shaped by various institutional practices. Throughout this explanation, the authors used our own institutions, Western Governors University and DePaul University's School for New Learning, in describing practices, as well as bringing in examples from other institutions as appropriate.

Program Development

Competency-based institutions must determine which degree programs to offer, and all CBE programs must determine which competencies should make up their degrees, domains, courses, and so forth. The usual practice is to develop internal standards, relying on external ones where available. DePaul University's School for New Learning (SNL) uses internal academic staff and international faculty to develop program competencies based upon state, professional association and regional accreditation standards. It also maintains a faculty expert in adult learning. Western Governors University relies upon its senior faculty embodied in its Program Councils (PC) to determine degree programs, domain areas, and competency outcomes. This PC faculty is comprised of experts from academia, business, industry, foundations, and non-profit companies in areas where WGU has developed programs in education, business, information technology, and health professions. Additionally, WGU, SNL, and other competency-based program generally use the external standards of competency established by state education offices, professional accrediting bodies, and industry certifications as means of adopting and customizing its competencies.

Marketing and Recruitment

Those individuals who already possess competency through prior work and academic experience are those most attracted to competency-based education. DePaul's SNL relies almost exclusively on its reputation as the largest Catholic University in the United States and on word-of-mouth to promote its competency-based programs. Western Governors University does little mass-marketing; instead, it works with several Internet-based lead-generating enterprises to reach out to interested adult learners. Word of mouth from current students and successful graduatess becomes increasingly important to reach prospective students as the University flourishes. WGU employs a cadre of enrollment counselors to communicate by e-mail, online chat, and telephone with prospective students, explaining the CBE model of distance education, the rigorous demands of online study, and the support structure of the University to enable CBE online. WGU, as a private non-profit institution, is particularly interested in recruiting persons currently underrepresented in higher education: those with rural residences, from ethnic minorities, from lower income households, and individuals who are the first of their families to attend college in their generation. Currently 83 percent of their students come from one of more of these categories (Eastmond, 2007). SNL's resident degree program began 30 years ago in inner-city Chicago, and has always served a high proportion of underserved students. It now extends those opportunities to distance and remote students all over the world through its online degree programs.

Admissions

It may not be true of all CBE offerings, but generally these programs and institutions have a more open approach to admission. This is both is terms of the frequency of admissions and the requirements for attendance. Prospective students at DePaul's SNL work first with an advisor to take an academic assessment. Afterwards they attend a learning assessment seminar that appraises their abilities to self-regulate, to think critically, and to communicate effectively in writing so that they can be assisted appropriately to succeed in the program. Western Governors

University admits students monthly after they have successfully completed an admissions assessment that screens applicants who will succeed in online CBE from those who will not. The assessment includes such areas as prior education (including required degrees – high school for undergraduates, bachelors for graduate students), math and language abilities, technology skills, students' context for support, and their commitment to weekly academic workload. Upon admission, WGU also requires all students to take an initial course (self-paced, lasting roughly two weeks) that orients them to online study, acquaints them with the library, and introduces them to their mentor. As a final exercise the student and mentor together they plan out an individualized academic action plan. This plan contains the sequence of assessments and associated learning resources, along with dates for completion for the degree.

Prior Learning

Universities and colleges typically affirm students' prior college-level learning in one of two ways: awarding credit-by-evaluation, and through assessment. WGU uses the assessment, whereas SNL uses both. In the first approach, students produce portfolio of relevant materials that document their competencies during the credit by evaluation process, usually over a period of several months as part of an initial course and under the guidance of an academic advisor. They document credit earned through prior college work, they investigate credit recommendations by the American Council on Education (ACE) or Dantes for military training and specialized licenses. During this process the student also compiles a portfolio of work examples and exhibits – artistic materials, reports, business plans, computer programs and the like. Students may take Thomas Edison State or Excelsior College examinations, utilizing credit awards in the process. This evaluation process often involves interviews about subject knowledge with a faculty expert to determine the type and level of credit that should be awarded for the student's competency.

SNL takes each student's prior learning experiences and assigns the student to both an academic and a career professional advisor who then form a team with the student to put together a customized degree plan that can incorporate prior learning into a grid of fifty competencies. Twelve of those competencies comprise core courses, and the other thirty-six are divided into Arts, Humanities, Sciences, and career focus area competencies. Assessments of students' portfolios, licensing examinations, military credits, externship and advanced projects, all become part of the degree process. The State University of New York's Empire State College (SUNY ESC)'s competency-based MBA program integrates an online assessment of prior learning into portfolio development in its first residency course (http://www.esc.edu/esconline/online2.nsf/html/mba.html).

Taking the second or assessment approach to utilizing prior learned competency, WGU primarily requires students to demonstrate their knowledge, skills and abilities through taking the actual high-stakes assessments required of all graduates. Before doing so, they can take pre-assessments to determine their competency and deficiencies in various areas and receive mentor recommendations about how to best proceed during mutual development of the academic action plan. If students have sufficient college credit in various liberal arts areas, lower-division assessment requirements may be waived. Also, external certifications that are an integral part of the degree program that the student has already achieved, such as the SHRM certification for human resources majors or the CompTIA Security+ certification for network administration, are incorporated, thereby shortening the time for degree completion. Other programs similarly incorporate assessments -- such as SNL's required proficiency exams or demonstration of competency mastery through independent learning projects or portfolios.

Advising and Academic Planning

Since students vary in the amount of relevant competency that they bring to the degree program and differ in their educational goals, a large part of CBE involves developing with students an educational plan and continuously advising each student as he or she progresses toward degree completion. At DePaul University's SNL, students receive academic advising throughout their degree program from an academic advisor and career advising from a professional career advisor; both remain with the student as a part of the student's degree team throughout the student's program, and the institution has developed several online tools to facilitate student planning and progress. These include a "dashboard" for administrative services, as well as an online grid to self-monitor their movement throughout their degree program. WGU assigns each student to a mentor who works with them throughout their degree program – from the creation of an individual academic action plan, through bi-weekly or more frequent communication, and advising about the competency development and preparation to demonstrate that through assessments. WGU has placed that AAP online in a similar dashboard format to facilitate enrolling in learning resources, scheduling assessments, and tracking progress through the degree. SUNY ESC's MBA program offers similar mentoring; an assigned faculty member works with each graduate student by providing assistance with credit for prior learning, the planning of the individual's degree plan, and assistance throughout their course-taking experience at the college (http://www.esc.edu/esconline/online2.nsf/html/mba.html).

Learning

"Learning" is the colloquial term for the development of competency, the core involvement of students during their time at the University, since rarely do they embark on a degree being fully proficient in the field or discipline. DePaul University's SNL offers credit-bearing courses in classroom, blended, and online formats for this competency development. SNL utilizes web-based and streamed technologies to facilitate student learning, as well as accepting transfer courses and enabling various learning projects (http://snl.depaul.edu). Once the WGU student and his or her mentor have determined their level of competency, the mentor counsels the student to take the set of learning resources that best fit their needs. An online "course of study" document (similar to a syllabus) lays out the recommended resources, sequencing, and timelines for completion so that students can maintain satisfactory academic progress. These learning resources can be third-party instructor-led courses arranged with other colleges, universities, or educational enterprises, but more often consist of independent learning resources (ILR) in which the student can begin at any time and progress at their own rate. ILRs include e-learning tutorials, web-streamed video instruction, simulations, and materials shipped to WGU student homes such as DVDs, CD ROMs, and workbooks. Use of the online library and textbooks continue to be the mainstay of competency development (Eastmond, 2006).

Assessment

Assessments within distance competency-based educational practice differ primarily if they are stand-alone (as is the case at WGU) or embedded within courses (as at DePaul University's SNL). At SNL assessments vary based on the competency expert teams for that subject who determines the appropriate approach. There are four key assessment areas: the core degree courses area (termed Lifelong competencies); the Arts; the Humanities; and Career Focus Areas. These usually include coursework, final summative examinations, or project-based assessments in accord with DePaul's SNL student-centered mission. WGU strives to include multiple measures to ascertain competency at the domain level; (several domains comprise a degree). These include objective and essay assessments delivered online and proctored at a testing center near the student's residence. They also include performance tasks that demonstrate problem-solving or development of a professional product, such as a business statement or lesson plan. Assessments may also involve observations of student performance, such as in student teaching in a live classroom. Degrees at WGU culminate in capstone projects that integrate the learning from several domains into a substantive product and its oral defense. As mentioned earlier, Excelsior College and Thomas Edison State College deliver comprehensive examinations at a distance that result in college credit that can be used within their own institutions or utilized at hundreds of other colleges and universities.

Challenges and Opportunities

Competency-based education at a distance (or on campus) has yet to become the norm in higher education, yet the model is increasingly being recognized as an important educational reform and alternative means of adult learning. Certainly the regional, national, and association accreditation of CBE institutions, schools, and programs lend credibility to this approach. These CBE programs face similar measures of success as their higher education counterparts – that of enabling successful student experiences through recruitment, retention, academic progress, satisfaction, and graduation. Indeed it is the qualifications of graduates to perform the professional roles for which they have been prepared and their meaningful involvement as world citizens that form the measure of merit for CBE programs. SNL's mission of student-centered learning and for its graduates to be global participants is demonstrated by the opportunities it offers its students in short international programs onsite in Asia, Africa, and Europe. These opportunities are often the first and only time that working and underserved adult students get a chance to travel abroad. WGU also measures its success in terms of its ability to serve groups such as low income, first-generation college, ethnic minorities, and rural students as fulfillment of its mission (Eastmond, 2007).

One challenge confronting CBE is its acceptance in transfer between institutions of higher education and with employers for reimbursement. WGU has fastidiously worked to make the translation of its competency units into credit hour equivalents for this purpose, translating a pass as "the student has demonstrated competency at a grade equivalent of B or better" (Eastmond, 2007, p. 10). Various accreditations have helped with this acceptance, as has various agreements with the Department of Defense, and major business partners that comprise WGU's National Advisory Board. As the seventh largest private university in the United States, SNL has similar agreements with government, business, and international partners. Transfer of credit and degrees from one institution to another has been the prime reason for the European Union Higher Education Area's interest in the competency-based approach (Colledo, 2007).

Another challenge is harnessing technology in an effective way to deliver CBE through a distance anywhere in the world. WGU grapples with assessment delivery in secure, proctored locations overseas and has heretofore restricted its programs to active duty US military personnel who have access to such testing environments at bases and military installations. Similarly, the digital learning materials WGU utilizes for students to develop competencies -- from electronic databases, e-books, various companies, websites, and open courseware -- can seem fragmented until their interface is circumscribed into a common learning management system platform. As time goes on, new methods of digital security will provide avenues of further promise for student testing and assessment in online programs. Technology can continually be leveraged to facilitate academic discourse in learning communities and the interaction between mentors and their student advisees.

Another challenge that is not unique to CBE is the accurate defining of learning units; however, the CBE approach holds the most promise of developing precise means of determining credit equivalencies. As Watkins and Schlosser, 1992, explain the Carnegie unit (the basis of the credit hour) relies upon a teacher-centric model (i.e., 12.5 hours in a classroom with a qualified instructor equals 1 credit hour). The credit approach has evolved to include some dimensions of student work (e.g., 2-3 hours of outside work expected for each classroom hour), but is quickly becoming difficult to calculate given the plethora of instructional activities in which students are engaged in online learning that are independent of time or place. Based somewhat on these authors' proposal of a student outcomes-based approach to defining credit hours, universities such as DePaul's SNL and Western Governors University are continually re-defining competency-units (credit equivalencies) in a meaningful way. This approach, when refined and disseminated, may be emulated by other post-secondary institutions as they increasingly grapple with the meaning of credits.

> One of the basic requirements for education in the 21st century will be to prepare students for participation in a knowledge-based economy…(adult) students need new and different information resources, skills, roles, and relationships. The traditional educational model,based primarily on the concept of the school and the teacher in a classroom, standing aloneand not interconnected with society or any other educational institutions, will not generate competence in a knowledge society (Harasim, Hiltz, Teles & Turoff, 1996; as cited in Paloff & Pratt, 1999, p. 166).

The promise remains for competency-based distance higher education to deliver affordable, accessible, quality education to working adult students regardless of location and at their convenience. The appeal of this model to accelerate time-to-completion for adults with competency and to ensure a level of proficiency for graduates seems to be growing throughout the world. As CBE programs and institutions graduate increasing numbers of capable professionals, the promise is being realized.

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Redesign for Distance Learning Conversion: Case Study of a Graduate Course's Evolution

Linda J. Emerick, Ph.D.

Introduction

There are many challenges for course conversion from face-to-face to a distance learning format. This is true for conversions to fully online and conversions to "hybrid" courses—courses offered partially through distance learning and partially face-to-face. Both can present equally significant challenges. For example, university instructors have observed that online portions of courses require more time to administer and teach than face-to-face class sessions. They have also learned that approaches to online teaching, assessment, and interactions with students are influenced by communication that is primarily through email and downloads (DiBiase, 2000; Lazarus, 2003; Thoms, 2005). Educators must use a wide range of strategies to address the unique needs of online instruction. Some report using constructivist approaches that emphasize students' interaction and collaboration. Others utilize a more structured approach with carefully worded syllabi and highly structured learning activities (Moore, 2002). In fact, the most recent report on online education in the United States indicates most universities believe "learning outcomes for online instruction are the same or superior to those for face-to-face instruction" (Allen & Seaman, 2006). In addition to these general findings, there is a growing body of qualitative studies that have examined course conversion in more detail and depth. The qualitative research has investigated the different roles, processes, and dispositions that instructors have when designing and teaching online courses. It appears that the roles, attitudes, and considerations for design are quite different from those for face-to face instruction and are very complex (e.g. Barajas & Owen, 2000; Dewar, 2003; Donaldson & Conrad, 2002; Thoms, 2005).

Conversion of courses for distance learning can be effective and, at the same time, complex. What must the designer/instructor consider when converting face-to-face courses to fully or partially online instruction? From the perspective of the instructor and the student, which forms of instruction best meet their needs? This study examined data from the redesign of a single face-to-face graduate education course through two iterations of distance learning. It followed the evolution of the course through conversion to a fully online version and then to a hybrid version. The purpose of the study was to describe the processes, perceptions, and outcomes associated with the two conversions and provide insights for others who may take on this design challenge. The following research questions guided the study:

1. What changes occur in objectives, learner outcomes, communication, and the roles and responsibilities of the instructor and students when face-to-face courses are converted to online and hybrid versions of a course?
2. What are the perceptions and beliefs of students and the instructor regarding the strengths, weaknesses, and effectiveness of different versions of the course?
3. What factors and considerations are critical when making design decisions about course conversions for distance learning?

One Course, Three Designs

The graduate course that was the focus of the study was named "Advanced Processes of Teaching and Learning." Graduate students described it as the "most difficult course" in the Master of Education degree program for elementary and secondary teachers. While the content of the course was familiar to teachers (instructional models, teaching and learning theory), the processes covered were new to even the most experienced educators (front-end analysis, instructional systems design). Using their own classroom students and setting as a starting point, the teachers were introduced to the rigorous and highly analytical processes of instructional design and evaluation. Courses content covered the steps of identifying instructional problems in their school settings, conducting instructional goal analyses, learner and setting analyses, reviews of research, and designing effective learning solutions. Using data from their front-end analysis, all students in the class evaluated instructional models, adapted and modified the models, and developed new instructional solutions that addressed the original problem. Regardless of format, these were the basic competencies covered in each course version.

The first iteration of the course was the on-campus face-to-face version. It consisted of 15 class sessions (45 contact hours over 15 weeks). The format included lectures, small group activities, group and small group discussions, and in-class work on projects and assignments. The instructor monitored student progress formally and informally through assessment of assignments and discussions in class sessions. The students had two texts for the course, supplemented by handouts and additional notes from the instructor. Communication was primarily through face-to-face discussion and written feedback on assignments.

The second iteration of the course was fully online and arose out of a need of the university. The instructor had not previously indicated a desire to convert the course for distance learning. In an expansion of international studies, secondary teachers in Shanghai, China participated in a version of the university's masters degree program. The graduate courses were offered by university faculty either onsite in Shanghai or through conversion to fully online courses. The course, "Advanced Processes of Teaching and Learning", was selected for online conversion (Hartzler-Miller, Emerick, & Kenton, 2006). Blackboard 6.0 was selected as the format for online instruction. The Blackboard site contained four learning modules that included written lectures, learning materials and activities, a variety of website links, and a discussion board forum. Students had one textbook to supplement the online materials. The course was 10 weeks in duration and all communications between the instructor and students were through e-mail and online documents. There was a "teaching assistant" located in Shanghai who helped the instructor monitor communications.

The third iteration of the course was a hybrid format that included both face-to-face class sessions and Blackboard 6.0 online learning. Graduate students received 21 hours of face-to-face instruction (6 class sessions) and 25 hours of online instruction (45%/55%) over a 15-week period. The hybrid course included five online learning modules similar to those in the fully online course, online learning activities and supplemental materials, and links to a variety of websites. Students had one required textbook to supplement online materials. Face-to-face class sessions included lectures, discussions, and project work sessions. Communication between the instructor and students was through e-mail, document attachments to e-mail messages, and discussions in class.

Methodology

The study used both quantitative and qualitative methodology to describe and analyze the evolution of the graduate course, "Advanced Processes of Teaching and Learning", through the different conversions. Data sources included:

1. Reflective notes of the instructor and interview data from a previous study
2. Documents and notes from planning and design of the three versions of the course
3. Student self-reports and open-ended questionnaires
4. Student and instructor course evaluations
5. Summary records of e-mail communications
6. Course syllabi, lesson plans, learning modules, instructional documents and teaching materials
7. Samples of student assignments and projects
8. Summary course assessments, scores

Content and inductive analyses were used to examine data from written documents, self-reports and questionnaires, interviews, and reflective notes. This form of analysis identified common characteristics and common themes within each version of the course. Descriptive statistics were used to analyze summary records, course and instructor evaluation reports, and other numerical data. Data were collected from three different semesters in which the different versions of the courses were offered. Each selected semester and course appeared to be representative of the three versions. The three course versions in the study were:

<u>Face-to-Face Version (Fall, 2004)</u> Comparison of course evaluations, student responses to open-ended questionnaires, and sample assessments indicated that the selected class was representative of other face-to-face versions of the same course offered by the researcher between 2001 and 2005. Eighteen graduate students who were experienced elementary and secondary teachers enrolled in the course. All students successfully completed the course with overall grades of A and B.

<u>Online Version (Spring, 2006)</u> Comparison of course evaluations, e-mail communications, and sample assessments from a study conducted of an earlier version (Hartzler-Miller, Emerick, & Kenton, 2006) indicated this course was typical of the online conversion. Twenty-five graduate students living in Shanghai, China enrolled in the course. All were proficient in English and were experienced secondary school teachers and administrators. Twenty-three students completed the course successfully with overall grades of A and B. Two students withdrew due to health issues.

<u>Hybrid Version (Fall, 2006)</u> Comparison of course evaluations, student responses to open-ended questionnaires, sample assessments, online communications indicated that the selected class was representative of previous offerings of the hybrid course. Seventeen graduate students enrolled in the course and all were experienced elementary and secondary teachers. All students successfully completed the course with overall grades of A.

Findings

The initial examination of student ratings from course evaluations revealed little difference among the three versions of the course. When asked to rate the course for overall satisfaction and effectiveness on a scale of 1 to 5 (1 indicating unsatisfactory, 5 indicating very satisfactory), students gave the face-to-face course a score of 4.81. The online course received a score of 4.55 and the hybrid course was given a rating of 4.85. However, further analysis revealed several differences among the versions of "Advanced Processes of Teaching and Learning".

Evolution of Course Objectives

As revealed in the course syllabi, the learning objectives for "Advanced Processes of Teaching and Learning" changed in each version of the course. In the face-to-face version, five learning objectives guided instruction. For the online and hybrid versions, there were four and three objectives respectively. Content analysis of the course objectives showed that those for the face-to-face course tended to be vague in wording ("Systematically analyze and evaluate educational situations using appropriate data collection…) and were not always aligned with a specific learning assignment or assessment. The objectives stated in the syllabi of the online and hybrid versions were more precise ("Systematically collect, analyze, and evaluate data about learning and content goals, learner, context and setting…") and were aligned with the course assignments and assessments. In fact, wording from assignment directions and scoring rubrics were reflected directly in the objectives for both course versions.

The conversion from face-to-face instruction to distance learning in the fully online course resulted in the elimination of the objective, "Engaging in meaningful reflection about ways to improve teaching and instruction…" Analysis of the instructor's interview responses and notes indicated that the modification was considered necessary due to fears about limitations of technology for online learning, her own inexperience in managing online discussions, and concerns about language issues among the Chinese teachers. The objective reappeared in the hybrid version of the course.

Students' evaluations and comments about the course objectives supported the content analysis. Some students in the face-to-face course stated, "Your instructions for the assignments are clear but do not always match the syllabus" or " The syllabus (objectives) could have been clearer". They also gave the learning objectives the lowest overall rating recorded on the course evaluation: 4.23 (on a scale of 1 to 5 with 1 indicating unsatisfactory and 5 indicating very satisfactory). They scored all other items on the evaluation between 4.69 and 5.0. Students in the online course gave a rating of 4.42 for clarity and organization of the course but did not evaluate the clarity of course objectives specifically. Students in the hybrid course gave an overall score of 4.50 for the learning objectives and had no negative comments among their responses on the questionnaire. Their positive responses included statements such as, "What I was to do and why I was to do it were clear. Thank you."

The instructor's perceptions of changes made to learning objectives in the three versions were mixed. Initially, she disliked changing the face-to-face course's objectives to those for the online course. According to her, the modification had"…taken the soul out of the course. This was 'slash and burn'". As one of her colleagues expressed it, she believed the conversion became "all about the students being able to navigate the Blackboard site" and less about the original objectives of the course. However, the instructor's beliefs changed when considering the objectives again for the hybrid course. The analysis and breakdown of the objectives into their basic parts from the online version provided the foundation for restating and realigning the objectives more carefully in the hybrid version.

Evolution of Course Assignments and Learner Outcomes

There were many differences among the three versions of the course for learner assignments and overall learning outcomes. Regardless of format, students were expected to understand the history and role of instructional design, identify instructional problems in their school settings or in case studies, conduct instructional goal analyses, gather data for learner and setting analyses, review and evaluate related research, and design effective learning solutions. To accomplish the latter, they had to demonstrate that they could evaluate and adapt or modify instructional models and develop new instructional solutions that addressed the original instructional problem.

Findings from the content analysis of student assignments from the face-to-face version indicated that assignments were written with much detail and were personalized to the learner's professional setting. The students chose issues from their professional setting and projects took on the aspect of "storytelling" with many examples from the classroom. Over half of the front-end analysis assignments for the course were 15 or more pages in length as students wrote about their students and their schools. The guidelines for the assignment suggested 8 to 10 pages as sufficient. An example of this type of assignment content is shown below:

> I have taught fourth grade in the southeast area of XXX for ten years and am quite comfortable addressing the needs of a diverse student population. Managing a wide spectrum of academic abilities with a variety of instructional strategies has become a natural routine. This year, however, I have a new position as facilitator in a different elementary school. My principal is also newly appointed to her administrative job. Our school has a unique history. In the past, it has been an alternative school and a life-skills adult functional school. Families in the neighborhood began a battle to get their elementary school back. The only route that was found to be successful was to make the school a magnet school. At present, XXX School not only has a 3 and 4-year-old Outreach Special Education Program, a self-contained kindergarten class, and a primary adaptive class, but also has the magnet focus of multiage classes.
>
> Neither my principal nor myself have had any experience teaching in a multiage school, but we do have somewhat of an understanding of what it should look like. However, in our first weeks of acclimating ourselves to the students, staff, scheduling, and families, we realized that there was an overall misunderstanding or complete lack of knowledge of the intention of the multiage magnet program. Parents who have had to apply for their child to participate in the magnet program are unaware of the multiage homeroom setting, questioning why kindergarteners are traveling to lunch with first-graders.

The content analysis of corresponding assignments from the online version indicated a major change from those of the face-to-face version. This was largely due to changes in instruction. Instead of choosing their own instructional problems for the assignments, the online students used a single case study presented by the instructor. For example, instead of completing the front-end analysis assignment for their school or classroom, they applied the analysis skills to the case study of the fictitious “Mrs. Albert” and her high school English classes. Instead of using “storytelling” and examples from real life, the students’ assignments were presented as individual questions that mirrored the process to be learned. The example below illustrates how the review of research assignment was changed for the online version.

> Mrs. Albert is preparing to conduct a search of research articles and expert opinion related to her instructional problem and front-end analysis. Review the information she has gathered so far in Steps 1, 2, and 3 of the front-end analysis (goal analysis, learner analysis, setting and context analysis).   Answer the items below:
>
> 1. What are three to four categories of research Mrs. Albert might investigate to learn more about her goal, her learners, or her setting and context? Explain why each category is appropriate to investigate.
>
> 2. Mrs. Albert has found 3 articles that might relate to her instructional problem. The research/expert opinion articles are located in this section of Learning Module 2 (Cool Influence, Core Curriculum, and Gender Differences). Skim each of the 3 articles. Which one article would you personally select as **most** relevant to Mrs. Albert's needs assessment? Give the title of your choice below.
>
> 3. Why did you choose the article you selected in #3 above? Write a brief explanation of why you think it is the best for Mrs. Albert.

Student assignments and products from the hybrid version were similar technical report—brief, accurate, but with explanations and examples. For example, content analysis showed that the majority of students’ instructional solution assignments did not include “storytelling” and wandering explanations. Instead, they wrote responses to the different parts of the assignment, providing brief descriptions and examples in an objective manner. In comparison, the assignments were concise but provided much more detail than assignments from the online version. An example follows:

The instruction for the solution will take place in the form of a unit of Language Instruction during the class's Language Arts Block with Miss XXX. This is appropriate because the students are with Miss XXX at this time and writing and grammar are part of the XXX County Public Schools curriculum. The unit of instruction will span five to seven days. There will be five 45-minute lessons taught during the unit. Each lesson will be presented from 10:00a.m until 10:45a.m. Many students receive reading interventions at various times during the morning. During this time Miss XXX has all the students present in the classroom before they transition to another teacher for math and science instruction. The instruction will take place in the students' classroom which is a trailer located behind the elementary school. It is important that learner's feel comfortable in their surroundings and that they have all materials accessible to them during instruction (Lewis, 1998). The students have been learning in the trailer for the duration of the school year. This indicates it is the best environment for the intended instruction. The lessons planned for this unit will be tied into the students' first writing composition. At the beginning of the school year the students wrote a personal narrative about a time they lost something in accordance to VSC indicator 4.A.2.a, which requires that students compose written presentations to express personal ideas.

Again, analysis of assignments, syllabi, and assignment guidelines indicate the changes resulted from differences in instruction and how course requirements were explained. While students in the face-to-face version received extensive verbal directions from the instructor and limitless opportunities in class to ask questions and develop their assignments, students in both the online and hybrid versions relied more on online directions and examples. For the students in the hybrid version, instruction for course content and guidance for assignments were delivered in four ways and the assignments were integrated throughout. First, the online learning modules provided content, activities, and guidelines about the assignments, blending both real life application and a case study example. Second, in-class lecture and discussions reinforced the learning modules and addressed any student confusion. Third, structured rubrics provided a step-by-step framework for the student to begin his or her assignments. Finally, samples of the assignments completed by former students in the course, along with annotations by the instructor, were available as examples.

Students' perceptions of assignments and what they demonstrated varied among the three versions. 100% of the students in the face-to-face version gave a rating of 5.0 (on a scale of 1 to 5 with 1 indicating unsatisfactory and 5 indicating very satisfactory) for "assignments relating directly to their profession". Similarly, they gave an overall rating of 4.92 for "assignments being appropriate for demonstrating their new knowledge". Additional comments from questionnaires and evaluations indicated that the students' also valued "having a choice of focus for my assignments." However, several also complained that "assignments are not clear or seem to change" and "there is too much to learn in too little time."

The perceptions of students in the online version were more difficult to discern. 88% gave a rating of 4.4 for "assignments are evaluated fairly" and 91% rated "accomplishment of learning goals" at 4.5. There were few comments through e-mails or questionnaires about the usefulness of the assignments although a few hoped to use the information in their schools in the future. A few also indicated they were not sure they would use the information again.

Students in the hybrid version gave ratings for assignments slightly below those of students in the face-to-face version. 100% of the students in the face-to-face version gave a rating of 4.8 (on a scale of 1 to 5 with 1 indicating unsatisfactory and 5 indicating very satisfactory) for "assignments relating directly to their profession". 100% also gave a rating of 4.8 for "assignments being appropriate for demonstrating their new knowledge". They, too, responded similarly to those from the face-to-face version and identified " having a choice of what I can do for my projects" and "it was a real application of what we are learning" as best features of the their course assignments. Unlike the other course version, they made no negative comments about assignments.

Finally, the instructor had her own beliefs about the quality of the course assignments and demonstration of student learning. Initially, she believed the assignments for the online version were "only a faint version of what the other students experienced. There was little emotional connection between the students and their assignments." This was partially supported by responses from students on course evaluations. The Shanghai teachers gave their lowest overall rating of 4.17 for "enthusiasm for the course." This was low in comparison to the other two versions of the course. However, after analysis and revision to incorporate online learning, she stated that the assignments for the face-to-face version did not demonstrate the learning she had hoped for. In the end, she believed the structured format of the hybrid version produced the most useful and effective learning experiences and assignments for the graduate students.

Evolution of Communication

As expected, each of the three versions of the course had very different forms and quality of communication between students and the instructor. However, the reactions of students to the different forms of communications were sometimes surprising.

For the face-to-face version of the course, all communication between the students and the instructor occurred during class time through discussion and one-on-one consultation. Students could also communicate with the instructor by e-mail but most waited for the weekly class session to ask questions and discuss assignment issues. Communication also occurred when the instructor wrote comments on assignments returned to students as part of the evaluation process. Samples of assignments indicate that often the comments were lengthy and detailed. Analysis of course evaluations and student questionnaire responses indicated that quality of communication was an important feature of the course. Students gave a cumulative rating of 4.77 for "responsive communication from instructor" and most frequently made comments were about "good instructor interaction and support" (mentioned by 53%) and " good interaction and communication with other students" (mentioned by 35%). However, there was a drawback to the flow of communication. 25% of students who submitted comments about negative aspects of the course mentioned "instructor spends too much time on the 'whiners' and 'goofy people'" and that class time was "wasted by discussions that go on too long."

There were three modes of communication for the online version. The primary mode was e-mail messaging. The second mode, from instructor to students only, was through announcements and information on the Blackboard 6.0 site. The third mode was also through e-mail but included written edits and comments on assignments that the instructor returned to the students via e-mail. An analysis of the e-mail communications from students to the instructor showed that most inquiries were to confirm receipt of assignment attachments, ask for extensions to complete assignments, and report technical problems with accessing online learning modules. There were few questions about course content or assignment directions. However, the students rated quality of communication for the course both high and low. 88% of the students rated quality of communications between them and the instructor at 4.1 and 18% gave a rating of 3.0. In contrast, 92% stated that the rate and quality of responses they received from the instructor were "excellent and helpful" (4.5). At the same time, some e-mail communications indicated the students "would like to see the instructor" and asked when the instructor would visit them in China. In comments about the course, students selected "communication" as the area in greatest need of improvement for the course.

For students in the hybrid version of the course, communication was a blend of the written and verbal communication and in-class discussions of the face-to-face version and of the Blackboard 6.0 site and e-mail exchanges of the online version. Students in the hybrid version frequently e-mailed the instructor with questions about course content and assignments. It was not unusual for 10% to 20% of the students to submit drafts of assignments and ask the instructor to "Please read what I have so far and let me know if I am on the right track", depending on the assignment. There were also occasional e-mail requests for extensions and technical help. With fewer class hours, it was expected that students would rate direct communication with the instructor and classmates at a rate lower than students in the face-to-face version. However, 100% rated instructor/student communication as "very good" to "excellent" (4.87). 93% of the students believed that there were excellent opportunities for "open, respectful discussion" (4.73) in the class. Content analysis of responses to open-ended questions revealed no comments about quality of communications.

The perceptions of the instructor were aligned with those of the students in the three versions. However, she believed that her communication with students about their completed assignments took on a new and more important role in both the online and hybrid course versions. Analysis of sample assignments indicated that she wrote more comments and used evaluation of the assignments as a teaching tool to a greater degree in the online and hybrid versions. In the face-to-face course, comments and responses to students were general—"good work on this part", "this might need more detail." Comments to students in the other two course versions often explained problem areas and gave examples for improvement. The instructor believed she spent more time communicating with students through e-mails and through comments on student assignments for the online and hybrids versions. However, she did not document time spent in communication.

The Evolution of Student and Instructor Roles

The greatest variations among the three versions of the course occurred in roles of the graduate students and the instructor. The face-to-face version provided the baseline information for the comparison among the three versions.

For the students in the face-to-face course, the instructor was the primary source of information and instructional support. This was evidenced by the total amount of face-to-face instruction that happened in the course (45 hours) as well as the amount of lecture, and the amount of group discussion that took place. Students did not view this as negatively and instead rated the course favorably for "instructor feedback and interaction with students" (4.92) and "offering a stimulating and challenging course" (4.92). It was important to the class members that the instructor was available to address every question they had and clarify assignments and content. Content and inductive analysis of student comments on questionnaires found the themes of "instructor is helpful to me" and "the instructor is very knowledgeable" as the two most frequently mentioned positives in this category. One student explained the perceived instructor role in this way: " I thoroughly enjoyed the class and the only problems I had were my own that kept me from concentrating 100%. But [the instructor] was always there to encourage me, to keep me going on."

There was a dramatic shift in the roles of the students and instructor in both the online and hybrid versions of the course. In both instances, online learning modules written by the instructor became the vehicle through which students managed their own education. The instructor, by both her own and the students' assessments, moved into the role of a facilitator for these two versions. By design, the students were given broad timelines for completion of learning modules and assignments. There was little communication from the instructor during these periods except to direct inquiries from students. Students were expected to decide when and how to conduct their learning and assignments while the instructor was available to provide feedback. Students in the online version of the course expressed concern about managing their own learning in responses to a pre-course survey. They had never participated in an online course before and were uncertain what to expect. However, the majority adjusted well to their new role by the end of the first learning module as evidenced by the decrease in the number of late assignments. There were seven late assignments for the first learning module and only three for the second learning module. As the course progressed, only one student continued having difficulties managing his own learning.

Students in the hybrid version of the course ranked the "online learning modules" and the "ability to work independently" as the two greatest strengths of the course. Their responses and comments cited "ability to self-manage" and "my choices for what and how I am learning" as primary reasons why the hybrid version was effective for them. They gave an overall rating of 4.93 for the quality and effectiveness of the course. In addition, while the majority liked the online portions of the course, 100% of the students stated during a group interview session that the six face-to-face class sessions were an important as part of the class. 23% of those responding thought perhaps only 4 to 5 class sessions were necessary. They stated that they liked communicating other students and having questions answered by the instructor in person.

The instructor saw major changes in her role among the three versions. She believed she changed from "dispenser of knowledge and information" to colleague and facilitor. Previously, in the face-to-face version, the instructor believed she dominated both class time and decisions about student projects. The conversion of the course to a distance-learning format forced her to shift the responsibility for learning to the students. In her opinion, the hybrid version provided the best opportunity for the students to function as independent, adult learners with the instructor shifting emphasis to the student as the decision-maker. At the same time, it seemed to satisfy her personal need for interaction with the students. "I did not realize how much the force of my personality was a factor in the course until I had to step back, away from the students in the online and hybrid courses."

Conclusion

As researchers have noted, the roles, attitudes, and considerations for the design of distance learning instruction are quite different from those for face-to face instruction. This study revealed the complexities of design by following the evolution of a single course. The findings indicate that many, varied factors play a role in the successful conversion of a face-to-face course to an online or hybrid version. While students gave high marks for effectiveness to all three versions of the course, data revealed subtle differences. These differences were evident from the qualitative data. They included shifts in attitudes and perceptions of the learners and instructor toward each version, variations in learning objectives, changes in formats and quality of assignments, challenges in communication, and a move to more student-centered learning. It was clearly demonstrated that the beliefs of the instructor/designer also play an important role in making a successful conversion. The instructor's personal preferences and assumptions about learning appeared to initially block objective consideration of distance learning possibilities for the face-to-face version. Careful analysis of the course components, information from students, and examination of learning outcomes led to improved design for a hybrid version of the course.

Findings from this study are not generalizable and apply only to the instructor, students, and events for conversion of this particular course. However, revelations about the three versions of the course may help others who are attempting distance learning course redesign. Several key questions are critical for the instructor who, as the course designer, is making decisions about conversions for distance learning.

1. Has the designer conducted an objective, in-depth analysis of the course to identify opportunities for distance learning?

The instructor in this study would not have compiled data necessary for the redesign of the original course under ordinary circumstances. After all, the student evaluations indicated it was a sound course. However, an in-depth analysis of all features of a face-to-face course can help the designer identify areas of improvement and opportunities for distance learning in an objective manner.

2. Has the designer contemplated changes that would be necessary for the course to incorporate distance learning? What would be gained? What would be lost?

Learning objectives, assignments, and communications for the face-to-face version of the course underwent major revisions to incorporate online components. There were concerns that the intent and quality of the face-to-face course could be compromised in the conversion. The designer must weigh the value and impact of necessary changes before making conversions for distance learning.

3. Has the designer anticipated his or her needs and the students' needs for professional communication and personal interaction?

Findings indicated that, regardless of format, graduate education students who are working professionals prefer interaction with others in their profession. The majority of students in the face-to-face version and the hybrid version valued and utilized discussions and dialogs (face-to-face and online) with the instructor and colleagues. Students in the online version preferred more personal communication with the instructor. In course conversions, the designer must consider how to maintain the quality of communication within a distance learning environment.

4. Has the designer considered how course conversion might impact his or her method of instruction?

Findings of the study demonstrated that the personality of the instructor had become the focus of the face-to-face version. The conversion of the course to online and hybrid versions placed the students at the center of their own education. By providing more opportunities for online instruction, the instructor became a facilitator and the students became responsible for managing their learning. Designers must consider the impact, positive or negative, that conversions to distance learning may have on the role of the instructor and the students.

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AT A DISTANCE: A Model for Distance Education

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ABSTRACT: Trying to shoehorn "traditional" instruction into a distance education format ignores key features of distributed learning environments. Designers and educators of distance education have some knowledge of how their instruction will be delivered—what "must" be used. The AT A DISTANCE model, and acronym for seven identified key stages, explicitly incorporates contextual issues into the early stages of systemic instructional design to select the most appropriate technologies available to build effective distance education programming.

Introduction

Instructional design (ID) offers a systematic process for ensuring the development of effective learning environments. In the world of distance education, that same desire applies. The creation of learning solutions through ID is typically based on a model that serves as a framework for the design and development process. While distance education reflects a specific context for which instructional programming is produced, it maintains inherent features that require a customized model to guide development for this delivery approach.

As found in the "traditional classroom," designers and teachers want to be sure that their students are receiving quality education. As Head, Lockee, and Oliver (2002) found, unlike traditional classrooms distance education presents a myriad of different (and sometimes new or difficult) media or modes in regards to how the instructional program has to be delivered.

Consider the technologies that may be in use. What if a particular system of providing distance education has limited (or non-existent) face-to-face interactions? Do time delays exist among members of the learning community? Is the targeted class synchronous, asynchronous, or a blend of both? Professors teaching in distance education environments are aware that there are other complexities as well: what technologies are available, how easy are they to use, what are the uses; what is possible, probable, unlikely, or impossible to do? These considerations should factor into how materials will be organized, developed, presented, delivered, and ultimately designed and tested for maximum learning effectiveness.

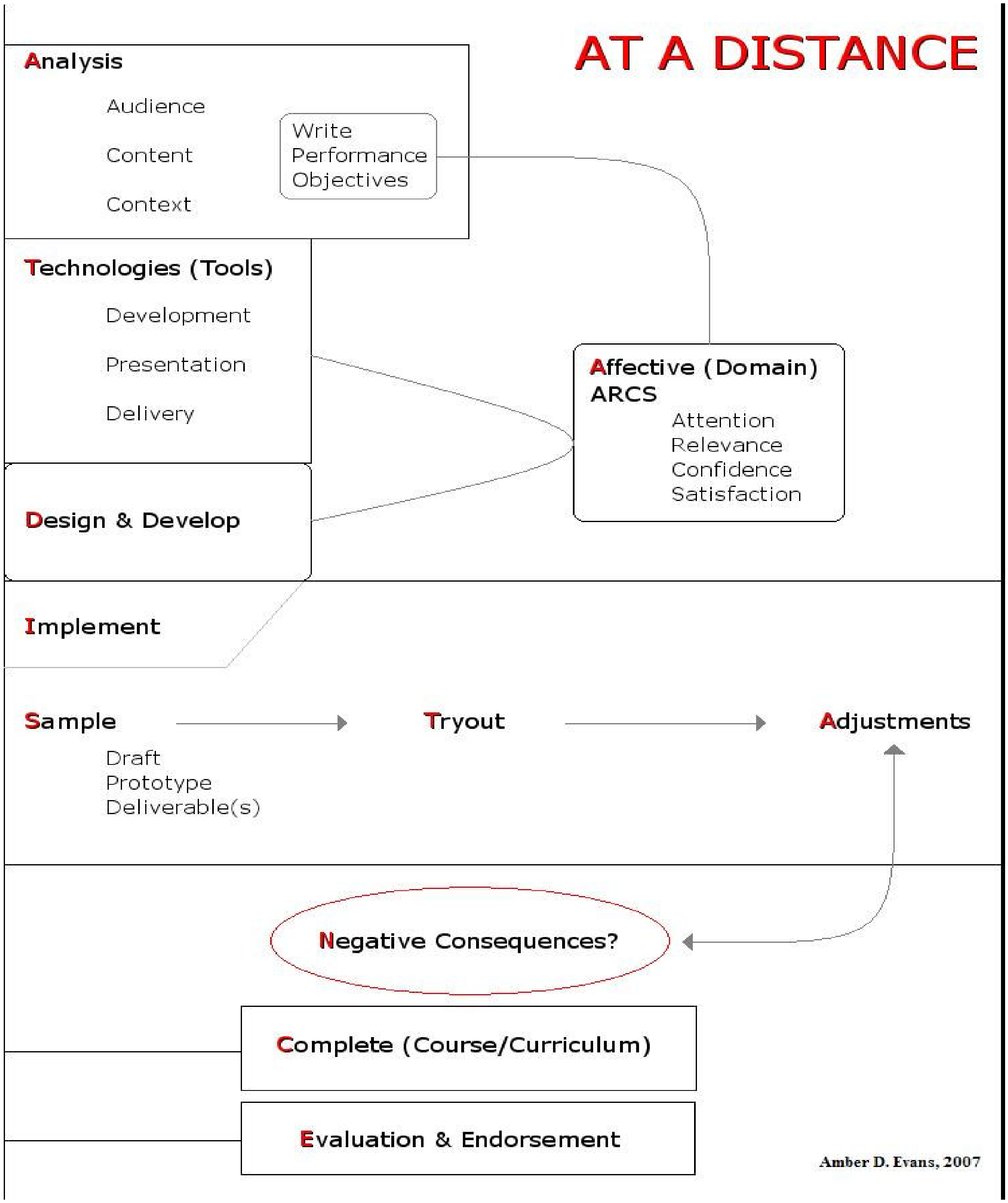
Distance education does not offer a new or better way of teaching or learning, it is a different context that provides another approach to teaching and learning. As Gustafson and Branch (1997) stated, "[t]he greater the compatibility between an ID model and its contextual, theoretical, philosophical, and phenomenological origins, the greater the potential is for success in constructing effective learning environments" (p.16). If the model can be aligned to the way it is going to be used, the instructional designer will be more likely to create a successful learning experience (in any medium). The same is true for distance education. The model by which distance courses are developed must consider the features of this specialized learning environment.

The model consists of seven key stages, four of which have sub-stages of their own. This model, called AT A DISTANCE, is an acronym for the primary seven stages: Analysis, Technologies, Affective domain, Design & develop, Implement, Sample, Tryout, Adjustments, Negative consequences, Completion, Evaluation & endorsement. The foundational concept for the AT A DISTANCE model was drawn from the following existing models: the ADDIE model (Rothwell & Kazanas, 1992), the ARCS model (Keller, 1987), Gustafson and Branch's (2002) suggested models for an organizational setting, and Mager's (1997) Performance Analysis flow diagram. Combined aspects from each of these established and respected models have resulted in the current model that provides a hybrid solution to the production and systematic approach to distance education.

What makes this model different from many others is that it immediately acknowledges the significant influence that administrative or existing infrastructure places upon the designer or instructor in choosing how to best design for the delivery system in place. According to Gustafson and Branch (1997), "[m]odels also assist us in selecting or developing appropriate operational tools and techniques as we apply the models" (p. 21). Related to this principle, any designer or teacher would prefer to have full control over what, how, and why they would choose to use a particular development tool, media, or mode to deliver their instruction. The reality is that an instructor is presented with a list of available technologies and told to "pick one or several" to deliver their instruction. It may seem like a step backwards, and in many situations, it is. Often being "stuck" with a particular technology that does not match the instructional goal will result in an ineffective instructional experience.

An analogy may help: imagine spending an enormous amount of time developing an exquisite-looking square peg and then being told it will need to fit into a round hole. Parts of the peg will need to be stripped away to make it work, or one may have to begin again to create the properly fitting round peg. The goal of the AT A DISTANCE model is to help designers see the round hole at the beginning and to build peg(s) appropriately while (hopefully) reshaping the hole at the same time. Through early recognition of the technologies and tools the instructors are "bound" to use, instructional designers can create a more complete and cohesive learning solution.

A Closer Look: "AT A DISTANCE"



As mentioned earlier, AT A DISTANCE is an acronym for the primary seven stages of this proposed ID model: Analysis, Technologies, Affective domain, Design & develop, Implement, Sample, Tryout, Adjustments, Negative consequences, Completion, Evaluation & endorsement. The AT A DISTANCE model is about taking established systematic design of instruction with clear performance objectives in mind and selecting the appropriate technologies or tools to build learning that appeals to the learner's affective domain. From there the coursework is developed in stages of modules and units. At the stage of implementation, a prototype module or unit is created and tested. Adjustments are made at which point the designer steps back and asks, "Are there negative consequences in having my learners do what I'm asking them to do?" Depending upon the answer, the prototype is either further adjusted or tested. When satisfactory, the next sample (module, unit, etc.) repeats this process. This continues until all prototypes are satisfactory in which case the course can then be completed where a final evaluation of the course is conducted before moving on to endorsing the final product (which in this case would be the course in its entirety or a curriculum as a whole).

Analysis

Borrowing from the Analysis phase of Rothwell and Kazanas' (1992) ADDIE model, the analysis stage as part of AT A DISTANCE is a look into the audience's characteristics (needs/desires), the content to be taught, and the context in which it will be held. The level at which these three parts receive treatment will vary. Therefore, an in-depth review of the audience may or may not be required. As Gustafson and Branch (1997) had determined within a given classroom of "typical classroom instruction" for a college course:

> Most teachers assume (with real justification) that students will be assigned to or will enroll in their classes and that there will be a specified number of class meetings, each of a pre-determined length. The teacher's role is to decide on appropriate content, plan instructional strategies, identify appropriate media, deliver the instruction, and evaluate the learners … teachers usually need to identify and adapt existing resources rather than engage in original development. (p. 38-39)

In the case of a distance education course, however, a closer look into the demographics of the target group may be pertinent to development. Consider that the audience is likely to be broader in age, experience, and locale. What discrepancies exist? Will any of them require special services or alternate accessibility? If nothing else, be sure to understand what the learner-related characteristics are for the target audience. Find out what prior knowledge, skills, abilities, and attitudes they may have. If possible, also determine audience members' ages, gender, races and what their general aptitudes may be. (Rothwell & Kazanas, 1992).

After the audience has been defined, one must analyze the instructional content. This activity is defined by Gibbons (1977) as "the process of breaking large bodies of subject matter into smaller and instructionally useful units" (as quoted in Rothwell and Kazanas, 1992, p. 133). The resulting process of this allows designers to proceed with the development of instruction.

Lastly, an analysis of the learning context needs to be performed. Designers need to be aware of the settings in which the instruction will be taking place. This simply means being aware of wherein the instruction will be engaged and the actual environment of the learned material when applied outside of the instruction.

With these three sub-parts completed, the next step is to write the performance objectives. Here, designers determine exactly what it is that learners will *be able to do* as a result of the instruction (or module, or unit, etc.). At this point in the AT A DISTANCE model, note that the performance objectives are connected to the Affective domain segment of the model. Before learner's attitudes are addressed, the next stage in the proposed model will be discussed.

Technologies (Tools)

Designers and instructors are expected to be proficient not only in knowing what technologies can do for them instructionally, but also how to proficiently utilize such technologies for distance course development and teaching. With only so much time and so much software available, it is nearly impossible to fully understand how or what is the "best" media is. There is media for development. There are media and tools for delivery. There are still different ones for presentation and others still for activity or engagement among learners. With so much to choose from and utilize, it can overwhelming.

For this reason, this stage is an important one to incorporate into the process of developing a distance course. Expect to spend a fair amount of time either working with someone knowledgeable or doing a fair amount of research to determine which methods (and media) will work best for the intended learning outcomes.

This stage is often the most frustrating—yet interesting—segment of the process. As part of this process, designers may need to assess whether or not media selection choices will need to be adjusted. Gustafson and Branch (1997) illustrate, "[i]nstructional development models can directly or indirectly specify products, such as time lines, samples of work, deliverables, and periodic endorsements by appropriate supervisory personnel. While models provide the conceptual reference, they also provide the framework for selecting or constructing the operational tools needed to apply the model" (p. 24). When done properly, the end result is learning that aligns with the original desire of the instructor.

Affective (Domain) ARCS

The affective domain is often regarded as a difficult aspect to address in the ID process. Engaging education and learning is thought to be important because it draws the learner into the situation, making them focused and active in the instructional program.

This is why the third part of the model is important to the design of distance education. Keller's ARCS model (1987) is also an acronym for: Attention, Relevance, Confidence, and Satisfaction. The inclusion of the ARCS model is designed to draw attention to the how and why's of the actual design and development of the course. Tied into the performance objectives, it ensures that the desired performance is relevant and can be met with confidence in the end. If the ARCS model is connected with the Technologies segment of the AT A DISTANCE model, then designers can assess whether or not the presentation and delivery of the material maintains attention and gives the learner enough feedback or interaction to instill a sense of confidence in their learning. Once it has been established that the analysis is complete and that the technologies are suitable and the affective domain has been given address, designers can begin planning and developing the actual instruction.

Design & Develop

This stage is common in all ID models and needs little explanation. It is where all the previous stages come together in the building of cohesive units and modules, as part of a course or larger curriculum. This will vary widely as much of it will be dependent upon what technologies were selected and what outcomes were desired. Some materials may be newly developed (taking the longest) while existing materials may be re-purposed into a different format that is more suitable for the distance learner to use and understand. As these parts are close to completion, the next stage of the AT A DISTANCE model can begin.

Implement

In this stage, full implementation of the distance course is not yet intended, as in the ADDIE model. Instead, this stage is a form of formative evaluation, allowing for a Sample to be created, tested, adjusted, and tested again. The idea is that in this stage, the implemented product will be pilot tested in a similar learning environment as the intended instructional setting. This process would allow for the most useful information to be fed back into the revision of the unit or module. Multiple versions and multiple modules or units can move through this segment at any time for as many times as needed to perfect the learning experience (en route to obtaining the desired performance objectives).

Sample → Tryout → Adjustments.

As sub-parts to the Implementation stage, these steps work together to identify a functional draft, prototype, or deliverable to then be tested in a realistic setting. The idea is to be as close to the "real deal" and to obtain feedback that can then be incorporated into the revised version of the instructional program. Once the sample item has passed the Tryout and Adjustments sub-stages, it can then be reviewed in the next primary stage.

Negative Consequences?

Are there negative consequences? This segment of the AT A DISTANCE model is borrowed from Mager's (1992) Performance Analysis flow diagram for performance improvement. In this segment, Mager asks if what learners are asked to do is punishing to them. For example, if learners are required to engage in some wiki board discussion, but the discussion board silently "times out" while they are working on their revisions, then the users lose all of their work when they attempt to submit or reload the page. When this happens, this is a negative consequence of the technology (or perhaps even in the learning itself) that is detrimental to the learner's attitude and instructional experience. In short, learners were doing as instructed, and actively engaged to the point of being unaware of being "disconnected." When attempting to "do good" and turn it in, they lost all of their work, discouraging them from wanting to do the same next time. Removing these problems early on also helps to establish the look of a complete and finished product.

Completion (of Course/Curriculum)

After the course has passed the Negative Consequences review and appears to be functional and engaging (or fun), then the unit or module can be developed in completion. Each unit or module can be completed at different times and plugged together in the end to form a cohesive course ready for learning.

Evaluation & Endorsement

The course is finished and all that remains is to conduct evaluations. Referring to Kirkpatrick and Kirkpatrick's (2006) four levels of evaluation, you could determine at what levels the course meets the requirements and at what levels your students are also assessed at. In this case, the course evaluation is of primary concern and it should be noted that feedback from students and other designers would be ideal in determining the effectiveness of the overall course. When an evaluation has established that the course is complete and meets all objectives and finishes up with learners who can transfer their knowledge, the course is ready for teacher or departmental endorsement.

Conclusion

Why use AT A DISTANCE at all? Gustafson and Branch (1997) stated:

> Systems-oriented models, such as those created by Branson (1975), Dick, Carey and Carey (2001), and Smith and Ragan (1998), typically assume a substantial amount of instruction will be created, such as an entire course or entire curriculum. Substantial resources are typically provided to a team of skilled instructional developers and subject matter experts. Whether or not original production or selection of materials will occur varies, but in many corporate settings original development may be required. Assumptions about the technological sophistication of the development and delivery systems also vary, with the decision often being based on the infrastructure available for course delivery. The amount of front-end analysis is usually high, as is the amount of tryout and revision. Dissemination and utilization may be quite wide, but probably does not involve the team that did the development. (p. 36)

As part of addressing the wide-use and far-reaching capabilities of distance education, AT A DISTANCE recognizes that many people are involved in the whole process of distance education. The instructor or designer creates the materials, but there is also policy, infrastructure, and technologies that also need to be taken into account and appropriately included within the whole scope of developing effective education for lasting learning.

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The roles of design: a new method of instructional design

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Introduction

This writing addresses the perception and activities of the instructional designer. At its core, this is an examination of beliefs, of values in the field; the questions we ask concern aesthetics, innovation, and the very nature of design. It is a theoretical investigation of our perception of ourselves as designers. "Men often define themselves through the skills they acquire, and the issues to which they put them" (Dreyfus & Dreyfus, 1986, 11). Most in the field of instructional design today would describe themselves as seeking to be either an engineer or scientist. (Visscher-Voerman & Gustafson, 2004).

We begin with addressing the current state of instructional design, which, by many accounts, is limited by its approach to design issues. Most in the field function as and seek to be *instructional engineers.* The driving force in instructional development often is the efficient production of instructional materials, which limits innovation. The current practice in instructional design concentrates on completion rather than quality. There is an inherent difference between *design* and *production*. Design is what happens past done; more than being a simple act of production, design is one of creation and innovation, of seeking of quality in all aspects of the process.

We will introduce a new conceptualization of the process of instructional design, replacing the worn steps of ADDIE with a series of exemplars for design practice; the instructional artist, instructional architect, instructional engineer, and instructional craftsperson. As a sequence of leaders, or as a representative design team, this "role-based" design method will encourage innovation and higher quality design.

Why has the field of instructional design failed to move forward? That is, forward with new ideas, forward with innovative methods of teaching using technology, and forward with advanced theories of the use of educational technology. We argue that the focus of the field since inception has been on lower level learning, often building work that centers on demonstrable content memorization as opposed to the more complex and advanced learning of thinking skills that is needed for the world today. As instructional designers, and in terms of learning, we aren't rich, we're simple. We aren't authentic, we're removed from context. We don't advance; we recreate the teaching and instructional methods of the past century.

Central to this failure of instructional design is our methodology of design. Most instructional designers, when questioned about their use of a design method, have a one word answer: "ADDIE". Clark (1995) held that learning from instruction media would only change when the method changed, regardless of media. Our limited success in designing instructional media comes when we are all using the same method of design. Logically, our design will only change when our design method changes as well, regardless of the medium of our work.

Examining the revered method of ADDIE does not provide an argument for continued use. It is not an invented method for planning and designing in instructional design, but rather a description of established and vernacular practice. It appears to be first *described* in a number of sources as a description for what actually happens in many design fields, only later to be formalized through the literature of instructional design (Molenda, 2003).

In reality and in common use, the ADDIE models differs very little from codified design models used in other fields, notably architecture. Architects commonly use the terms *schematic design, design development, construction documents,* and *contract administration* to contractually segment the process of design and constructing a building. However, while the process can be divided into these phases (along with subsequent client billings), within good architectural firms, almost no designer limits or constrains their design activity within these steps. For example, design still occurs during construction, often adding to the value of the design. Architecture has a rich history of design methodologies looking beyond simple steps, both in terms of codification, and in terms of analysis and evaluation before and after the formal design process (often called "pre-design" and "post-occupancy evaluation").

One can view the ADDIE model as a *recipe* for instructional design. Novice cooks follow recipes, without modification or extrapolation, getting the expected result (cf. Ratatouille, Bird, 2007). Completion, or done, is desired. For the great cook, however, we know that it is not how religiously they follow the recipe, but rather how they go beyond what is proscribed. Chefs, those we need to advance the field if not our culinary experience, make use of their imagination, based on a process, but also are not hindered by it.

The process of design cannot be codified in a simple recipe in any sub-field, from graphic to urban design. Instructional design, although ostensibly following a single lockstep process, also exhibits this same diversity of method. In a study of the methods of instructional designers, Visscher-Voerman and Gustafson examined the design processes of instructional designers. Most followed a traditional, rational, ADDIE based model, but their research showed that "design processes are much more heterogeneous and diverse" than the ADDIE model suggests (2004).

Logically various variations of ADDIE have been proposed, essentially slight deviations from the standard (see for example, Gibbons, Visscher-Voerman, Hoadley & Cox, Parrish, Wilson, Reeves). Unfortunately, within these proposals, the total process isn't changing, just a different visual analysis of the steps of design. These proposed new models inlcude the star model, waterfall model, and spiral model, which minor changes of the process; they are ADDIE with make up.

The use of this proscribed method in teaching instructional design is understandable. Providing learners with a set of procedures to follow that is known to generate a predictable results is, to some extent, valuable. Novices in any field commonly seek a specific set of tasks that will guarantee success; however, as designers mature and address more complex problems, they generally decrease their use of a specific set of ordered actions. As noted in Dreyfus and Dreyfus (1986), novices in any field tend to seek rules and follow rule based behavior, while as an individual progresses in (design) skills, knowledge becomes less tacit, rules less explicit, and capability less defined by declared knowledge.

> "During the first stage of the acquisition of a new skill though instruction, the novice learns to recognize various objective facts and features relevant to the skill and acquires rules for determining actions based on those facts and features. Elements of the situation to be treated a relevant are so clear and objectively defined for the novice that they can be recognized without reference to the over all situation in which they occur. We call such elements 'context-free,' and the rules that are to be applies to these facts regardless of what else is happening 'context-free rules'. " Dreyfus & Dreyfus (1986)

Mapped to the use of the ADDIE model, this anticipates that the higher the design skill of the instructional designer, the less use and less applicable is this model. Novice designers will use the model with fervor, evaluated on their loyal steps in the process, as (theoretically) consistent with design skill. Educators use the method as a way to codify the process and produce standardizable results.

In reality, this model perpetuates a process of design that is lockstep in execution, boring to the designer, and frontloads the “good” parts of the design process. It is a disservice to the novice instructional designer to present this method as the sole process of instructional design. Later aspects of the process are demotivating; implementation is viewed as simply getting the job done and/or drudgery; evaluation is an afterthought if remembered.

Design is, of course, never done; good designers have in their psyche an impatience, a dissatisfaction with the status quo. They seek the challenge, the unexpected result. The goal of design education is not to produce consistent designs, particularly those that replicate previous designs. The goal must be to produce better *designers* and hence, designs as yet unconceived. Inherent in this goal for the profession is one of constant improvement and innovation of the design process.

How this is done is an ongoing debate in most design fields, with the exception of instructional design. Most design fields recognize the value of extensive work in design studios, addressing increasingly complex design projects. However, the design studio method of remains rare within instructional design education. Within the studio and within the design process is embedded the use and application of current theory, ideology, and professional behavior..

While being a designer implies having the explicit knowledge necessary, the implicit procedures, values, and attitudes needed to successfully design must also be explicitly developed. Design can be viewed as a system of beliefs, with expected behaviors, skills, and aesthetics. These aspects will advance the field of instructional design much more than technical or theoretical expertise.

Any design process has a series of different activities, with attention spent in various different aspects of the work. A broad understanding of the project, as well as background in the field and ability in each aspect of the work is needed. Some time must be dedicated to the experimental aspects of the work, both on specific projects and to generally advance. A rigorous understanding and evaluation of the field's body of knowledge must be applied. And the project must be implemented with skill and continuous improvement of the design, even after formal completion.

A number of theories and ideas guide the practice of instructional design, but we are also guided by our *perceptions* of our own practice. If we view the work of instructional design as the application of theories of cognition and learning, the inherent value is one of the learning sciences or perception, and that will guide the work. Similarly, if we view the process as simply one of the development of instructional materials, we will create work that is complete but limited. We must seek to include the full range of roles of the designer in every project, extending our self-image beyond that of the scientist or engineer.

One way to organize and present the *values* of instructional design is to use and emulate a series of roles as modes or exemplars for successful design practice. Being a designer, and acting as a designer, therefore, becomes more important than understanding what a designer does. Being able to be creative is much more important (and difficult) than knowing what creativity is. Presented here is a new design process, one which entails a number of "roles" instead of tasks.

Each of these exemplars of the process could also be described in a procedural tone, outlining actions that need to be taken, artifacts that need to be produced. Each will, of course, be inherently structured by sub-tasks. The process is not task driven, however, a major change will only come through changes in values, belief, attitudes and perceptions through revising our own perceptions of our work.

Roles

Instead of a recipe for making instructional design, we present a series of models for the behavior of instructional designers. There are a series of roles that procedurally will lead one through instructional design, and, more importantly, also act as a series of exemplars, which if followed, will improve quality and innovation within the field of instructional designers. We seek to make better instructional designers, not by providing a low level list of actions, but by giving the field a series of models of quality in each aspect of design work.

The roles of design we present here are archetypes, i.e., romanticized versions of real professions, exemplars of behavior and practice, which are valid as models for professional behavior in instructional design. As exemplars, we seek from them the best of their practices; for example, from the artist, creativity, and from the craftsman, patience and advancement through practice.

Each of the roles we have selected is well known through our society: artist, architect, engineer, and craftsman. Each title is often said with pride, or bestowed on another as praise. For example, describing someone as an artist denotes a creative skill with a medium, while an engineer brings a logic and reason backed by scientific knowledge. The term "designer" can also serve as an exemplar, when the full diversity of the work of design is included.

Each of the roles we highlight have been present in design for a long period of time, and most earlier design practices necessarily included all these attributes. In the Renaissance, these roles were blurred, integrated into the single individual or practice; for example, Leonardo da Vinci was artist and engineer, architect and craftsperson.

The practice of instructional design currently focuses principally on two roles, which we describe as an instructional engineer, and the other as an instructional manufacturer.
Much of the field seeks the scientific, rational approach to design, where answers exist, and the best method can be found, then adopted by all, and then developed through completion.

The Instructional Engineer

We use the term "instructional engineer" as an aspect of instructional design that is most addressed in instructional design programs. The instructional engineer focuses on the applying research derived models for learning. It is close to our vision of scientist, someone seeking new knowledge through research, but here as the role is an applied one, the term "engineer" is most relevant. Indeed, some argue that the field of "instructional design" itself is mis-named: “Some object to the word ‘design,’ suggesting as it does a rather arty orientation, and insist that what we really need is ‘instructional engineering" (Shepard, 2002).

Engineering is the creative application of scientific principles used to plan, build, direct, guide, manage, or work on systems to maintain and improve our daily lives. While scientists explore nature in order to discover general principles, engineers apply established principles drawn from mathematics and science in order to develop economical solutions to technical problems.

In our model, the role of the instructional *engineer* is one of instructional problem solving. Most engineers, either in the instructional field or in the main fields of engineering such as civil, structural, or mechanical engineering are highly trained professionals. In education, the instructional engineer ensures a product is usable by the target audience and makes the product achieve its educational goals. Contemporary, research-based ideas are used to develop instructional materials; educational theory is an important component of the work of the instructional engineer. The principle goal of the engineer is the functional efficiency of the work, planning and organizing the project. These are valuable aspects of the design process and can advance the value of the work.

In current practice, most design completed by the instructional engineer is passed on to technicians with little opportunity for change. In any design project, at some point, the conceptualization, the planning, the broader view have been completed, and the work must be implemented. Here too there are significant questions, of a choice between *completion* and craft. Most instructional design work these days is manufactured; ideas developed elsewhere are implemented by workers divorced from concept, aesthetics, or theory.

The instructional manufacturer

Most materials produced in the field of instructional design are completed by an *manufacturer* and not by an engineer. The manufacturer frequently is a technically skilled individual applying a pre-defined design template to solve an educational problem, delivering results as efficiently as possible. The solution to an educational problem is given or dictated to the manufacturer, whose responsibility ins one of simple, recipe formatted production efficiency. Production consistency and stability are of primary importance, resulting in products that are predicable and functional. As one expects a recipe from a cookbook to be predictably good but also what was intended, one should expect the results from a manufacturer to produce consistent, but not innovative work.

For example, when asked to develop educational materials for use through distance education, the instructional manufacturer might employ traditional instructional design methods to develop instructional materials emphasizing content presentation and application. Such materials are commonly delivered to learners via the most efficient technologies (e.g., online quizzes, Blackboard/WebCT templates, PowerPoint presentations, etc.). Most of these technologies are stable and, at the core, are based on educational theories such as constructivism, collaboration, or cognitive science, but such theories are remote from the manufacturer. Models for the design process would focus on the functional (i.e. "form follows function"). As with the architecture in the 1960's, an aesthetic could develop based on making the c technology work, on utility.

There are two major problems with this simplified process. First, design ceases with the conclusion of the engineering phase, and all prospects for qualitative improvement stop. The experience and technical skill that may be present with the manufacturer are seldom integrated with the scientifically based knowledge of the engineer. And second, the criteria for success of the manufacturer is one of quantity, not quality, of the number of functional widgets of pure production: Is it done? While efficiency may go up, quality does not increase.

What are the values of the manufacturer? Speed, consistency, and completion of the assigned tasks.

Contrary to the role of the manufacturer is one of the craftsperson. We seek to treat this phase of project development as critical to the worth of the end artifact; as part of the full design process. This phase is one which *adds* value to the project. It is needed, for the health of the process and the participant designers, that this portion of the work be a positive, additive, and generative portion of the work.

The Instructional Craftsperson

The instructional craftsman encompasses the work of implementation, but also still seeks to improve the project or design. Traditionally, craft work implies a high level of skill in execution, and while not having a focus on the research or theoretical foundations. It still has a good theoretical understanding of the field.

> As a verb, 'to craft' seemingly means to participate skillfully in some small-scale process. This implies several things. First, it affirms that the results of involved work will still surpass the results of detached work. To craft is to care. Second, it suggests that partnerships with technology are better than autonomous technology. For example, personal mastery of open-ended software can take computers places that deterministic software code cannot. Third, to craft implies working at a personal scale--acting locally in reaction to anonymous, globalized, industrial production--hence its appeal in describing phenomena such as microbreweries. Finally, the usage of 'craft' as a verb evades the persistent stigma that has attached itself to the noun. (McCullough, 1998, 21)

In modern society today, we have a view, a vision of "craftsperson", one of a highly skilled trades worker doing exceptional work, a benevolent artisan. Historically, a craftsperson was a highly skilled guild member, required to take in an apprentice to continue the guild. Inherent in the role of master craftsperson was the requirement of building the work *and* the next generation.

One can imagine a craftsperson building a a boat or wood strip canoe, by hand. The work is comparable to manufacturered efforts, but while similar, it does not regress to the level of detached reproduction by a human. The maker, the individual is engaged with the work. To some extent, the craftsperson is somewhat isolated from concerns of reality; in their own time, patient and still efficient, the work, not the schedule is of prime importance. It's done when it's done.

Our vision the instructional craftsperson includeds a high level of implicit knowledge developed from experience. They seek quality in both technical and aesthetic terms. They value the product more than the user or client; we expect physical manifestations of their work in their lives; calluses and patience.

Most practitioners today would view the addition to or description of the final phase of their work as an easy change to the process of instructional design. Adding the title "craftsperson" to the completion phase of the work does not, however change the process. This could be window dressing, and would amount to little more than lipstick on a pig. If the craftsperson is an appendage, a renaming of the manufacturing phase, there will be no true improvement, and will have the same real impact as calling in the graphic artist to apply some aesthetics to the project. For there to be value in craft, it must have a voice throughout the design, and be a real value in execution.

The building craftsperson, the mason of the Renaissance, evolved through time to become the architect of today, as buildings are now designed. There are still masons today, focusing more on production, but as design has become more complex, and as design has separated from construction, the role of architect has evolved as separate.

Architecture is a profession that still values craft and still seeks to train new architects in the means of production. It also educates practionners in the results of research and values aesthetics and craft. This holistic view, a broader approach to the design process is applicable too to the field of instructional design.

Architects today are expected to integrate all the functions of the design process, from initial divergent conceptualization to final evaluation. Architects are current with the newest research and technologies, have the skills to work in a variety of media, and integrate the needs of the user and the client with design ideas. We view this phase/role as one which includes a broad range of responsibilities; the instructional architect holds a viewpoint that is holistic, looking across the entire project, not just within the current activities.

The Instructional Architect

We view the role of instructional architect as one that has a balanced approach to instruction design, one which values aesthetics and innovation, applied current research, and which critically examines the solution to increase user engagement, motivation, and interaction. Instructional architects are unique in that they are not satisfied by simply solving the problem; the architect is motivated by extending the boundaries of the resources to explore solutions that enhance learner experience, moving beyond the educational and technological specifications of the instructional problem (i.e. design beyond done).

Developing an understanding of the entire project is critical to the design process; one must have a holistic view of the design challenge. Inherent in this understanding is an identification and recognition of the assumptions of the design problem, and a questioning of the design problem itself; what is the true nature of *this* design problem? This phase also examines the resources at hand and the theoretical and philosophical orientation of the project.

The *instructional architect* extends the engineer's functional and usable solution and attempts to incorporate aesthetics at the core of the design process. By doing so, the architect explores divergent solutions that extend and cultivate the affordances of a medium. The architect's approach to instructional design attempts to balance utility, usability, and aesthetics.

Having a broad viewpoint in the process of design is essential to a successful project, but beyond that wide view, the designer needs to specifically address the development of new ideas. In most design projects, a single driving concept is selected very early in the process. These ideas are generally pre-conceptions, ideas of what works and what could easily be done, and sadly, they are also ideas that have already been successfully executed. In order for new ideas to be adopted or even be conceived, the successful designer needs to explore many ideas; ideas that are different, unusual, that will fail or that will break the mold. In short, the instructional designer must work as an artist.

The Instructional Artist -

The final exemplar is that of the instructional artist, an iconoclastic divergence that embraces experiment and failure. Here the process of instructional design examines ideas that don't work, paths that are not expected, and allows for a more diverse range of conceptualization. Within the field of creativity training, there are a number of techniques that encourage examining wrong answers or the opposites of the expected results. Similarly, the phase of the instructional artist is fraught with failure, and one which diversifies thought. Here is where most innovation in the field will occur, not in the later roles of engineer or manufacturer, where 1% improvements are accepted as goal. The wager of the artist is to win big, with substantial increases in the value of designs, understanding concurrent risk.

Here, in this writing, we view artists as those with a mastery of a medium, with an intense focus on their work and a concern for aesthetics. They exhibit a high level of creativity, even to the point of working outside of society. Failure, unexpected results, and disturbance of the status quo mark the work of the artist; advancement of the finish product is not necessarily the goal, but is rather an advancement in the understanding and development of new ideas.

We view the role of the artist as one providing divergent thinking at the beginning of any project; providing aesthetic direction and inspiration throughout the project, and acting as the "what if" person on a project team.

The artist is an instructional explorer. The artist uses instructional problems as stimuli to experiment with media and affordances. The instructional artist may work without client or audience, only later attempting to apply to instructional practice what has been learned through the artistic experience. The artist embraces failure and engages in continuous self-criticism while attempting to understand both the problem and self.

Each role is critical at some point in the process, from the creativity of the artist, to the care and completion of the craftsperson; each serves as check and balance for the other roles, the engineer bringing the artist back to earth, the architect reminding the craftsperson of the needs of the client; and each is constant and integrated into the entire process, not taking the lead all the time, but present and engaged throughout.

Roles as process

We view these roles as generally sequential. Each role, in turn, leads the project, applying their own expertise: Artist, Architect, Engineer, and Craftsperson. This sequence is, of course, similar to many other iterations of design process, but given the use of these roles, these exemplars, each phase has it's own values and quality.

As with many other things, the methods and products of instructional design represent the values of the designer; our arguments here may be ones of belief. Present today in the instructional field is a belief that design is a purely rational and logical solution of problems, or a belief that inherent in any design must be aesthetic, spiritual, and philosophical aspects, or a belief that design must be inclusive, and spring from the ideas and actions of the learners.

Each of these roles may be performed as part of an individuals work on a design project, or they can be assigned to different parties of a team effort. They can be followed in sequence, but it must be understood that each aspect, each exemplar participates throughout the design process. For example, during the engineer phase, the sensibilities of the artist must still be present.

The Role Based Design Process can be used to organize and manage large teams or it can be used for projects designed by small teams or individuals.

Critical to the success of the process is the integration of the four design roles in the process; that artist, architect, engineer, and craftsperson are present throughout the entire sequence, although each role will take a lead in the design of a project.

Role based design process can be of value for instructional designers of all levels. For the experienced designer, a procedure for design is often in place. Applying new models or roles will help change the outlook and results. The use of a role based process will remind the experienced designer of other, divergent aspects of design methods, and serve to stimulate directed reflection as part of the process. The checklist is not used, but rather an understanding of different components of a complete designing experience.

For the beginner, use of a formalized linear design process can lead one through a challenging sequence of procedures; as artist, architect, engineer, and craftsperson; a checklist of tasks can help understand the process as well. Using Role Based Design in lieu of ADDIE will encourage an inexperienced designer to include aesthetic components through out the design process, to view the entire process as a whole; and to be encouraged to innovate as opposed to replicate design models.

Discussion

"You don't take a photograph, you make it." Ansel Adams (1902-1984)

Ansel Adams was lauded by many as *the* pioneering and visionary black-and-white landscape photographer of the 20th century. Throughout his life Adams exemplified the role of an artist by combining art, technology, spirituality, and an adventurous value for failure to capture and share visions of the American West through careful and conscious creation. He epitomized the values, philosophies, and practices of the Artist, Architect, Engineer, and Craftsperson roles; he is presented here as an example of Role-Based Design.

Adams is renowned as an artist for his stunning work, and we know that preceding that are years of experiment, trial, failure and exploration. He carried that vision of exploration without reward for many years, literally wandering in the wilderness.

Acting as the holistic architect, Adams developed the ideal of *previsualization,* a process of visually and conceptually exploring a scene and seeing in the mind's eye the final photographic print before film is exposed. Lacking this exhaustive phase of holistic conceptualization, Adams believed resulting photographs would only be a product of inspired luck at best, and, at worst, shallow and unable to communicate meaning.

With a visual objective in mind, Adams, acting as an engineer, used his scientific understanding of a composition's tonal values to capture the vision on photographic glass. After years of meticulous conceptual and technical refinement, Adams created the *Zone System*, a systematic approach of precisely defining the relationship between the visualized photograph and the final result, to ensure all light and dark values of a scene render effectively onto film. The Zone System has been practiced and embraced by thousands of photographers, solidifying Adams as both an inventor and educator.

Adams, a true craftsperson, is often best acknowledged for his unprecedented mastery in the darkroom. With the photograph captured on film, many photographers view the darkroom, as solely the *production* of a captured image on paper. For Adams, however, the act of creation did not stop when the picture was taken; the darkroom was where the photograph is *made*.

Embracing Role-Based Design

In lieu of an habitual, rearticulated summary of the Artist, Architect, Engineer, and Craftsperson roles, we will sever scholarly tradition and conclude with a collection of 12 questions one can reflect upon before, during, and after each design project. The premise of Role-Based Design is illustrated in people, not steps or processes; Role-Based Design encompasses the values, mindsets, philosophies, characteristics, responsibilities, traditions, and practices of real designers.

Artist *(playful experimentation)*

- When listening to the initial problem, how did I freely explore a variety of aesthetic, technological, and pedagogical possibilities (rather than applying past design solutions to the current obstacle)?
- What are some of the creative, unique, simplistic, complex, innovative, and bizarre ideas I exhausted when exploring the problem?
- In what ways have I failed during my design experimentation?

Architect *(holistic conceptualization)*

- What are the pedagogical, technological, and aesthetic characteristics/affordances of the proposed solution?
- How does the conceptualized solution provide opportunities for transformation in learning and/or instruction?
- What steps have I taken to create an instructional experience for the learner, as opposed to an instructional product?

Engineer *(scientific realization)*

- What are the physical, logical, pedagogical, technological, and cultural constraints of the design and implementation?
- What structural and technical features have I implemented to ensure scalability and sustainability of the solution over time?
- What measures have I taken to ensure a reliable, valid, and pedagogically-sound solution?

Craftsperson *(experienced evolution)*

- Have I improved upon the design conceptualized by the architect, or have I simply developed the final product to specification?
- How have I affected the quality of ideas, processes, and production? What are 6 things I could have done better during this project (i.e. conceptual items, procedural items, and developmental items)?
- What have I learned from this project that will ensure a higher quality of design and user experience for my next project?

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Relational, Structural, and Semantic Analysis of Graphical Representations and Concept Maps

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Abstract

The demand for good instructional environments presupposes valid and reliable analytical instruments for educational research. This paper introduces the *SMD Technology* (Surface, Matching, Deep Structure), which measures relational, structural, and semantic levels of graphical representations and concept maps. The reliability and validity of the computer-based and automated *SMD Technology* was tested in three experimental studies with 106 participants. The findings indicate a high reliability and validity. The discussion focuses on the development and realization of the three levels of the *SMD Technology* and applications for research, learning and instruction.

Introduction

The demand for good instructional environments presupposes valid and reliable tools, instruments and methodologies for educational research. However, many of them are developed with little or no theoretical justification, which leads to doubtful findings and no contribution to the improvement of learning environments (Novak, 1998). Accordingly, the development of new tools, instruments and methodologies to capture key latent variables associated with human learning and cognition requires a solid theoretical foundation.

One central interest of psychological and educational research is internal cognitive processes and systems, which are described by theoretical constructs such as mental models and schemata (see Seel, 1991). However, mental models and schemata are theoretical scientific constructs which are not directly observable. Accordingly, researchers can only learn about mental models or schemata if (1) individuals communicate their internal systems (Seel, 1991) and if (2) valid and reliable instruments and methodologies are used to analyze them (Seel, 1999). A wide variety of empirical approaches for the analysis of external representations of mental models and schemata exist (see Al-Diban, 2002), but they often lack a solid theoretical foundation and their analysis is considered to be very time consuming (Ifenthaler, 2006). On the other hand, new technologies such as concept mapping tools are being introduced into learning environments, but the analysis of data collected with such new technologies still places a huge demand on methodologies.

The purpose of this paper is to introduce the computer-based and automated *SMD Technology* for relational, structural, and semantic analysis of graphical representations and concept maps. We first introduce the theoretical constructs of mental models and schemata as a key concept for understanding human learning and problem solving processes. Second, the complex processes of externalizing internal knowledge representations (re-representation) will be discussed. Third, we introduce our own *SMD Technology*, which enables us to measure graphical representations and concept maps with three different quantitative indices. We then focus on the empirical reliability and validity testing of the *SMD Technology*. Finally, we introduce a broad field of applications for the *SMD Technology* within the field of research, learning, and instruction. The article ends with a conclusion and further perspectives.

Background

Mental models and schemata are theoretical constructs for understanding human learning and problem solving processes. Following the verdict of Piaget (1950, 1976), we argue that new information is processed by the complimentary processes of assimilation and accommodation. According to Seel (1991), a person can assimilate new information as long as an adequate schema can be activated. If the activated schema does not match exactly, it can be adjusted by means of *accretion, tuning,* or *reorganization*. The *accretion process* is defined as an accumulation of new information to the existing schema. *Tuning* can be described as a change of single components within the activated schema. The result of a successful adjustment of a schema is a subjective plausible solution of a problem or the understanding of new information. However, if the processes of *accretion* and *tuning* are not successful or if no schema is available at all, new information can only be accommodated by the process of *reorganization*. According to Seel (1991), the process of *reorganization* is realized by constructing a mental model (see Figure 1).

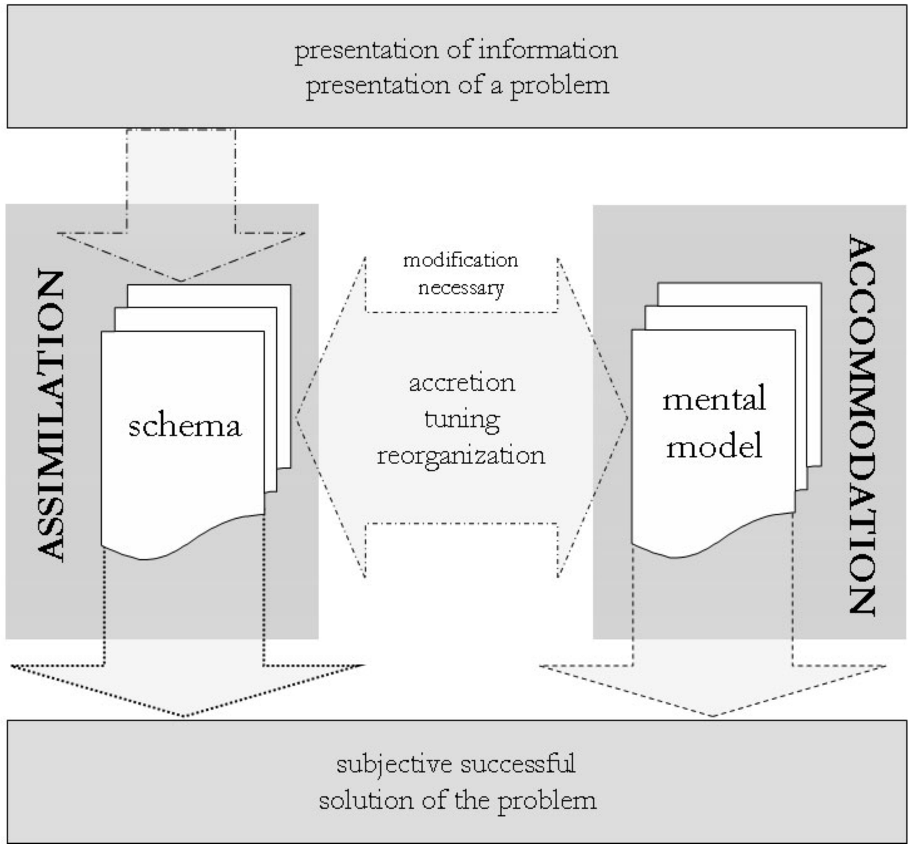

Figure 1: The process of assimilation and accommodation

Mental models are dynamic ad hoc constructions of individuals that provide subjective plausible explanations on the basis of restricted domain-specific information. Johnson-Laird (1983) describes the model building process as a step-by-step reconstruction of an initial mental model (*fleshing out*). Additionally, the *reduction to absurdity* (Seel, 1991) is used to test whether the activated mental model can be replaced by another mental model. However, as long as an activated mental model provides enough subjective plausibility to meet the requirements of a phenomenon to be explained, there is no need for the construction of a new mental model. Seel (1991) assigns mental models four general functions, (1) simplification, (2) envisioning, (3) analogical reasoning, and (4) mental simulation. Depending on the objective of the model-building person, one of the four functions is used for the mental model building process. In comparison to the activation of an available schema, the mental effort for the construction of a mental model is higher and more time consuming (Seel, 2007).

Accordingly, learning, reasoning, and problem solving involve the construction of mental models and schemata. In order to support successful learning, reasoning, and problem solving, it is necessary to investigate the mental model building process precisely. However, as it is not possible to measure internal representations of knowledge directly (e.g. schemata, mental models), the following paragraph will focus on the complex processes of externalizing internal knowledge representations.

Externalization of Internal Knowledge Structures

Theoretical constructs such as the mental models and schemata discussed above are used by cognitive and educational researchers to explain the complex phenomenon of human learning, reasoning, and problem solving. As long as these internal knowledge structures are not directly observable, researchers require adequate tools, instruments, and methodologies to allow people to externalize them. The process of externalization is considered as a conscious process of communicating mental models or schemata using adequate sign and symbol systems (see Le Ny, 1993; Ifenthaler, 2006). Hence, externalization can be realized through speaking out aloud, writing a text, drawing a picture, or constructing a diagram, graphic, or concept map (see Hanke, 2006).

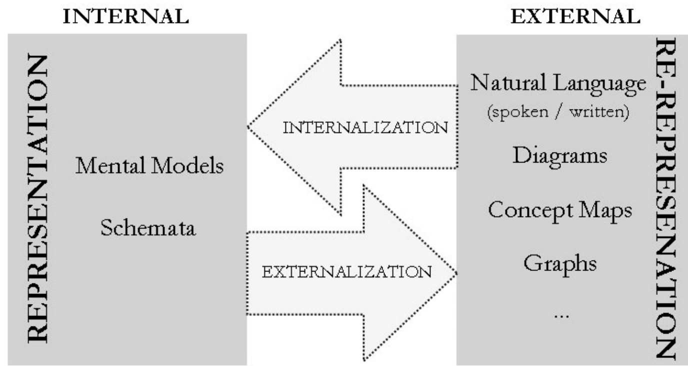

Figure 2: Interrelation of internal and external representations

As shown in Figure 2, we are able to distinguish between internal representations (e.g. mental models, schemata) and external re-representations (communicated using adequate sign and symbol systems). Furthermore, we argue that these two types of model representations are interrelated. First, through the process of *internalization*, a person is able to construct a mental model or activate an available schema. From the point of view of instructional design, the process of *internalization* is where we can systematically influence the construction of mental models by providing well-designed external re-representations (e.g. learning materials, feedback, etc.) of phenomena to be explained (e.g. Norman, 1983).

Second, the process of *externalization* enables a person to communicate his or her understanding of phenomena in the world. This perspective is the only way in which researches can learn more about a person's internal representations. Accordingly, adequate tools, instruments, and methodologies for the analysis of mental models or schemata can only be developed with a clear understanding of the complex processes of *internalization* and *externalization*. Although it appears to be possible to assess internal representations through their externalized re-representations, we need to keep in mind that the re-representations might be biased through the lack of communication skills, the use of inadequate sign and symbol systems or the use of insufficient research instruments.

Therefore we argue that instruments used for the analysis of such constructs must have a strong theoretical foundation and be tested for reliability and validity (Seel, 1999; Ifenthaler & Seel, 2005). A detailed review of methodologies for the assessment of graphical representations revealed a huge demand for an automated and computer-based tool (see Ifenthaler, 2006). As a result, we developed our own *SMD Technology*.

SMD Technology

Based on the theory of mental models (Johnson-Laird, 1983; Seel, 1991) and graph theory (Harary, 1974; Chartrand, 1977; Bonato, 1990; Tittman, 2003), the computer-based and automated *SMD Technology* (Surface, Matching, Deep Structure) uses (a) graphical representations such as concept maps or (b) natural language expressions to analyze individual processes in persons solving complex problems at single time points or multiple intervals over time. In the following, we define the externalized knowledge structures as a model *M*.

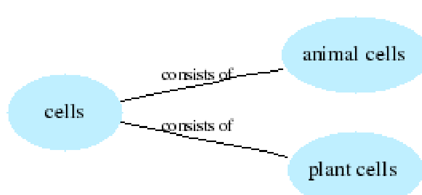

Figure 3: Model M_3 composed of two propositions P_i

Depending on the elicitation process (e.g. using the *Structure Formation Technique* [paper and pencil]; *concept mapping tools* [computer-based]; *natural language statements* [computer-based or paper and pencil]), the raw data should be stored pairwise (as propositions P_i) including (a) the *modelnumber* as an indicator of which model a proposition belongs to, (b) *node1* as the first node of the proposition, (c) *node2*, which is connected to the first node, and (d) a *link* which describes the link between the two nodes (see Figure 3 and Table 1).

Table 1: Raw data of a model stored pairwise (as propositions)

modelnumber	*node1*	*node2*	*link*
003	cells	animal cells	consists of
003	cells	plant cells	consists of
…			

After the raw data has been transformed into the standardized format (see Table 1), it is stored on a SQL (structured query language) database. However, the transformation process of paper and pencil models (e.g. *Structure Formation Technique*) is very time consuming. Therefore, we recommend the use of computer-based elicitation techniques which already support the standardized format (e.g. DEEP; CMap; MITOCAR) in order to guarantee a more economical analysis and additionally a highly reliable transformation process (see Ifenthaler, 2006).

Figure 4: User interface of the *SMD Technology*

The automated analysis process of the *SMD Technology* will be started by the researcher through the *User Interface*, where all stored models in the SQL database can be selected (see Figure 4). After selecting the models M_i for the analysis process, the system will automatically calculate three numerical indicators - *Surface*, *Matching*, and *Deep Structure* - and generate standardized graphical re-representations for each individual model M_i (Ifenthaler, 2006).

Surface Structure

The relational structure of each individual model M_i is represented on the *Surface Structure*. This simple and easily calculable indicator is computed as the sum of all propositions P_i in a model M_i.

$$\theta = \sum_{i=0}^{n} P_i \qquad [1.1]$$

θ is defined as a value between 0 (no proposition = no model) and *n* (n propositions P_i of a model M_i). The *Surface Structure* of model M_3, represented in Figure 3, would result in θ = 2. According to the theory of mental models (Seel, 1991), the number of nodes and links or propositions a person uses is a key indicator for the investigation of the progression of knowledge over time in the course of problem solving processes (see Scandura, 1988). However, although this first indicator enables a rapid and economical analysis of the relational structure of a model M_i, additional indicators are required for a more detailed analysis.

Matching Structure

The structural property of a model M_i is displayed on the *Matching Structure*. The second level of the *SMD Technology* indicates the range and complexity of a model M_i.

$$\mu = \max_{i,j}\{d(i,j)\} \qquad [1.2]$$

μ is computed as the diameter of the spanning tree of a model M_i and can lie between 0 (no links) and *n*. In accordance with graph theory, every model M_i contains a spanning tree. Spanning trees include all nodes of a model M_i and are acyclic (see Harary, 1974; Tittman, 2003). Figure 5 illustrates model M_5 and its corresponding spanning tree.

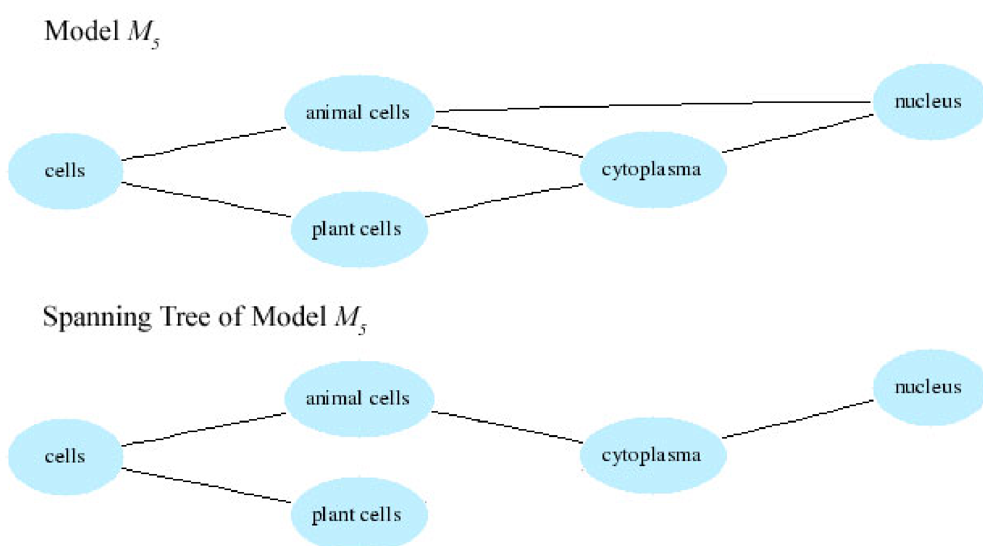

Figure 5: Model M_5 and its corresponding spanning tree

A diameter is defined as the quantity of links of the shortest path between the most distant nodes. For the calculation of the *Matching Structure* index, the spanning tree is transformed into a distance matrix *D*.

$$D = \begin{pmatrix} 0 & 1 & 2 & 3 & 4 \\ 1 & 0 & 1 & 2 & 3 \\ 2 & 1 & 0 & 1 & 2 \\ 3 & 2 & 1 & 0 & 1 \\ 4 & 3 & 2 & 1 & 0 \end{pmatrix} \qquad [1.3]$$

The *Matching Structure* index is calculated as the maximum value of all entries in the distance matrix *D*. The diameter or *Matching Structure* of the spanning tree in Figure 5 is calculated as follows:

$$\mu = \max_{i,j}\{d(i,j)\} = 4 \qquad [1.4]$$

The change in range or complexity of a person's model M_i is our second key indicator for the analysis of learning and problem solving processes (see Seel, 1991; Ifenthaler, 2006).

Deep Structure

The semantic composition of a model M_i is measured on the *Deep Structure*. The *Deep Structure* is calculated with the help of the similarity measure (Tversky, 1977) as the semantic similarity between an individual model M_i and a reference model M_r. A reference model M_r is defined as a subject domain-specific model (e.g. expert solution; another subject's model; the same subject's model constructed at a different time point).

In contrast to the graph theory-based calculation of the *Surface* and *Matching Structure*, model analysis on the *Deep Structure* is realized through a similarity calculation between a model M_i and a domain-dependent reference model M_r. Hence, a reference model M_r of high quality is a necessary precondition for a comprehensive analysis of the *Deep Structure*.

A similarity measure describes the degree of similarity between two objects, represented by a number between 0 and 1. Decisive for a similarity measure are objects with similar and different features. Tversky (1977) considered an object as an amount of features. The identification of a similarity between two objects is realized through a comparison of their features. The similarity formula takes not only the amount of similar features into account, but also the amount of different features. Lin (1998) defines similarity with the following three statements:

- The similarity between *A* and *B* is related to their commonality. The more commonality they share, the more similar they are.
- The similarity between *A* and *B* is related to the differences between them. The more differences they have, the less similar they are.
- The maximum similarity between *A* and *B* is reached when *A* and *B* are identical, no matter how much commonality they share.

Accordingly, the smallest similarity between two objects A and B is given if no common features exist. In this case, the two objects are completely different and the similarity measure is 0. The similarity measure increases with a rise in the number of common features. A complete similarity of all features results in a similarity measure of 1.

The similarity of models on the *Deep Structure* is identified through the feature „proposition" – the semantic characteristic of the proposition. The *Deep Structure* index δ is defined as the Tversky similarity between a model M_i and a reference model M_r. In general, we calculate:

$$\delta = \frac{f(A \cap B)}{f(A \cap B) + \alpha \cdot f(A - B) + \beta \cdot f(B - A)} \qquad [1.5]$$

A and *B* are the amount of propositions of a model comparison. The function *f(M)* corresponds to the number of elements in the amount *M*. The parameters *α* and *β* control the weighting of similar and different features. Both similar and different features are considered in the calculation if the weighting of *α* and *β* is equal ($\alpha = \beta = 0.5$).

The value of the *Deep Structure* index δ is defined between 0 (no semantic similarity between the models) and 1 (absolute similarity between the models).

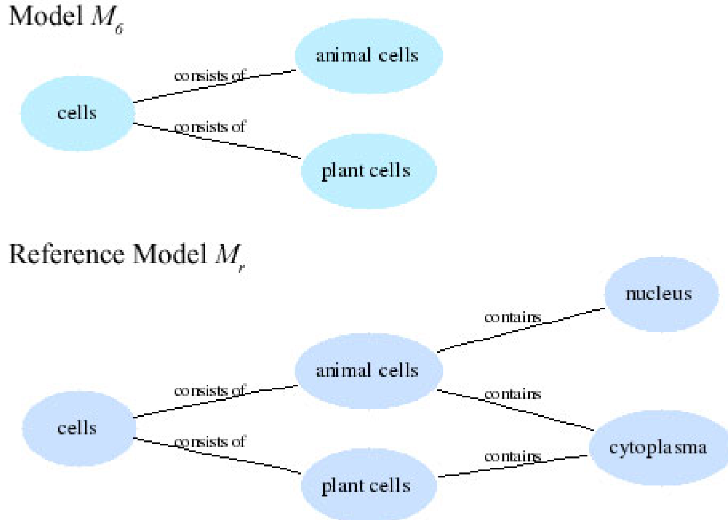

Figure 6: Model M_6 and reference model M_r

The *Deep Structure* or semantic similarity between model M_6 and reference model M_r is calculated in an automated iterative process. Every proposition in model M_6 is analysed for similarity with every proposition in the reference model M_r. The *Deep Structure* index is calculated as follows:

$$\delta = 0.57 \qquad [1.6]$$

Thus, the semantic similarity between model M_6 and reference model M_r is δ = 0.57 or 57%. The quantitative measures of the *Surface*, *Matching*, and *Deep Structure* can be used for further statistical analysis. A qualitative analysis is made possible with the standardized re-representations of the *SMD Technology*.

Standardized Re-Representations

The standardized graphical re-representation of the subject's data is constructed as an undirected or directed graph with named nodes and links. This automated feature of the *SMD Technology* is realized with the help of the open source graph visualization software *GraphViz* (Ellson et al., 2003). For every single analysis, four standardized *PNG* (Portable Network Graphics) images are generated. Images (1) and (2) are the re-representations of model M_i and reference model M_r (for an example see Figure 6). Image (3) represents the *similarity model*, including only the nodes and links which are semantically similar between model M_i and reference model M_r (see Figure 7).

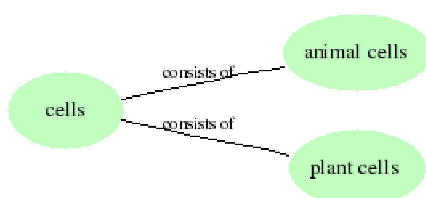

Figure 7: Similarity re-representation of model M_6 and reference model M_r

Image (4) is defined as the *contrast model*. It includes only nodes and links which have no semantic similarity within model M_i and reference model M_r (see Figure 8).

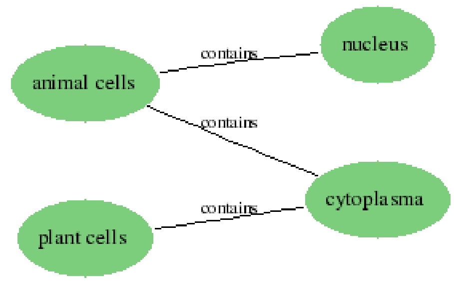

Figure 8: Contrast re-representation of model M_6 and reference model M_r

Experimental Validation of the *SMD Technology*

To investigate the objectivity, reliability, and validity of the computer-based and automated *SMD Technology*, we conducted three quasi-experimental studies. The objectivity of the *SMD Technology* was guaranteed by the computer-based and automated realization of the instrument. In the following section we report our results for reliability and validity of the *SMD Technology*.

Subjects

Three quasi-experimental studies (Studies 1, 2, and 3) were conducted with 106 subjects (70 female and 36 male) at the University of Freiburg. Their mean age was 18.3 years (SD = 4.6). The subject domain of Study 1 was geology and that of Studies 2 and 3 was geophysics. The subjects spent five hours on successive days working on complex problems with a multimedia discovery-learning environment.

Learning Environment

The multimedia discovery-learning environment consisted of four modules. The modules could be divided into declarative and heuristic modules. The declarative modules contained all information needed to solve the phenomenon in question, while the heuristic modules primarily supported the model building process (see Dummer & Ifenthaler, 2005).

Starting from the *problem & learning task* area, the subjects solve complex tasks from specific subject domains (Study 1: geology; Studies 2 and 3: geophysics). The subjects can navigate through different topics of the subject domain within the *curriculum module*. Additional information about the subject domain is provided in the form of various text documents, pictures, and audio recordings in the *knowledge archive*. The *Model Building Kit (MoBuKi)* provides the subjects with information about models, model building, and analogical reasoning. It contains three levels of abstraction of the material provided: (1) knowledge level; (2) procedural level; and (3) examples level. The *toolbox* is used to elicit the subjects' understanding of the phenomenon in question.

Procedure

The three quasi-experiments took place in the computer laboratory at the University of Freiburg. Subjects had to solve a complex problem while working with a multimedia discovery-learning environment. The problem solution had to be elicited on six subsequent measurement points as a concept map. Every subject was given an introduction to the use and construction of concept maps.

All subjects were randomly assigned to three types of treatments (see Ifenthaler, 2006). The groups were distributed as (a) *scaffolding-based learning*, (b) *self-guided learning*, and (c) *control group*. The subjects in group (a) received detailed feedback concerning their concept map during the model building process, subjects in group (b) received no feedback, and subjects in group (c) received no feedback and worked within a multimedia discovery-learning environment whose content was not linked to the complex problem to be solved. The quasi-experimental procedure consisted of three main parts:

1. *Pretest*: Before the subjects were able to access the multimedia discovery-learning environment, a pretest was conducted which included: (a) the domain specific knowledge test; (b) elicitation of the preconception of the complex problem to be solved as a concept map; (c) a test on cognitive learning strategies (LIST-Test); (d) a test on intellectual abilities (BIS-Test).
2. *Model building process*: During the quasi-experimental session, the subjects were asked to solve a complex problem while working within the multimedia discovery-learning environment. At five measurement points, the subjects had to elicit their understanding of the complex problem in question as a concept map.
3. *Posttest*: The individual learning outputs were captured with: (a) a domain specific declarative knowledge test; (b) elicitation of the final solution to the complex problem as a concept map.

The primary interest of the empirical investigation in this article is the experimental validation of the *SMD Technology*. Therefore, we focus in the following section on reliability and validity tests. However, details on the learning-dependent progression of externalised models and treatment effects during the three quasi-experiments are reported in detail by Ifenthaler (2006) and Ifenthaler, Pirnay-Dummer, and Seel (2007).

Reliability Test

For the computation of the test-retest reliability (Spearman's rank correlation), the *Surface*, *Matching,* and *Deep Structure* indices of measurement points three and four (control group) were used.

Table 2: Test-Retest Reliability of the *SMD Technology*

	Test-Retest Reliability
Surface Structure	.824**
Matching Structure	.815**
Deep Structure	.901**

** p < .01 (two-sided significance)

The results in Table 2 show a high significant correlation between the indices (*Surface*, *Matching*, and *Deep Structure*). Accordingly, this result is a broad hint for the reliability of the quasi-experimental study. On the other hand, we want to point out that mental models are individual ad hoc constructions (see Seel, 1991), and therefore standard reliability tests, e.g. *Test-Retest-*, *Split-Half-* or *Odd-Even-Method* (see Rost, 2005), have only limited validity as they consider the latent variable to be stable. However, the detailed research design of the three quasi-experimental studies and the applied learning environment guarantee at least an exact repeatability of the experiments.

Validity Test

Especially with newly designed and developed instruments (*e.g. SMD Technology*), it is necessary to map theory based characteristics to measurable criteria. The goal of the construct validation is to determine from a theoretical point of view what the instrument really measures. For this purpose, several methodological best practices[1] are available (see Lienert & Raatz, 1994, p. 226). A comprehensive analysis of the theory of mental models (Johnson-Laird, 1983; Seel, 1991) and available instruments for the assessment of models constitutes the

[1] Correlation of a test with several outside criteria; Correlation with tests with similar validation requirements; correlation with tests that assess other criteria; analysis of inter- and intraindividual differences in test results; factorial analysis (see Lienert & Raatz, 1994).

basis for the theory-based development of the *SMD Technology*. From an empirical point of view, the validity of the *SMD Technology* is identified with the outside criterion (1) MITOCAR, and (2) declarative knowledge.

Pirnay-Dummer (2006) developed the instrument MITOCAR (**M**odel **I**nspection **T**race **O**f **C**oncepts **A**nd **R**elations), which enables a structural and conceptual analysis of natural language expressions. The raw data of the third quasi-experimental study (N=47) was analysed with the MITOCAR software. In the following, we use the results of the MITOCAR analysis for validity tests of the *SMD Technology*.

Table 3: Correlation between the SMD Technology and MITOCAR (N = 47)

	MITOCAR (concept and structure)	Surface Structure	Matching Structure
MITOCAR (concept and structure)	-	.610**[1]	.527**[1]
Surface Structure		-	.766**[1]
Matching Structure			-

** p < .01; * p < .05 (two-sided significance)

[1] Pearson's Correlation

The results in Table 3 show significant correlations between the outside criterion MITOCAR and the *Surface* and *Matching Structure* of the *SMD Technology*[2]. After verifying convergent validity of the *SMD Technology*, we want to test the *SMD Technology* with another outside criterion. This second validity test is for divergent validity on the basis of *declarative knowledge*. We assume that there is no correlation between the *Surface* and *Matching Structure* of the *SMD Technology* and the *declarative knowledge* measure. Further, we assume a correlation between the *Deep Structure* and the *declarative knowledge*.

Table 4: Correlation between the SMD Technology and the declarative knowledge test (N = 47)

	declarative knowledge	Surface Structure	Matching Structure	Deep Structure
declarative knowledge	-	.273[1]	.112[1]	.355*[2]
Surface Structure		-	.766**[1]	.089[2]
Matching Structure			-	.166[2]
Deep Structure				-

** p < .01; * p < .05 (two-sided significance)

[1] Pearson's Correlation; [2] Spearman's Correlation

The results in Table 4 show no correlations between the *declarative knowledge* and the *Surface* and *Matching Structure*. This is consistent with the theoretical and methodological assumptions of the *SMD Technology* - the indices of the *Surface* and *Matching Structure* have no direct connection to the subject domain. The significant correlation between the declarative knowledge and the *Deep Structure* confirms the assumptions of the *SMD Technology* – we assume that persons with high declarative knowledge in a specific subject domain will also have a high *Deep Structure* index δ. To sum up, the empirical analysis revealed convergent and divergent validity with regard to the outside criterion. Additionally, the *SMD Technology* was part of a series of comparative studies of different quantitative and qualitative methodologies conducted in order to determine the methodologies' strength and unique characteristics and to report collective validity (see Johnson et al., 2006).

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[2] The *Deep Structure* index δ of the *SMD Technology* compares the semantic similarity between a model and a reference model. This feature is not available with MITOCAR. Accordingly, the calculation of correlations between the *Deep Structure* and the MITOCAR indices is not necessary.

Applications for Research, Learning, and Instruction

The use of different computer-based tools for re-representing knowledge structures (e.g. concept mapping software) has become increasingly accepted for research, learning, and instruction (Jonassen et al., 1997). In various research projects, concept maps have been used for analyzing learning outcomes, learners' knowledge structures, and for self-assessment (see Mansfield & Happs, 1991; Eckert, 2000; Stracke, 2004). In the field of learning and instruction, concept maps have been used for providing feedback and advance organizers and for facilitating problem solving tasks (see Jonassen et al., 1997; Stoyanova & Kommers, 2002; Al-Diban, 2002; Ifenthaler, 2006). However, a large number of the available tools do not support automated feedback and analysis features. Accordingly, the development of the computer-based and automated *SMD Technology* opens up a broad field of applications for research, learning, and instruction.

SMD Technology & Research

Re-representations of knowledge structures are often analyzed by raters using diverse scoring approaches (see Taricani & Clariana, 2006; Jonassen et al., 1997). Depending on the research question, the raters focus on the quantity and quality of nodes and links, causal relationships, semantic content, direction and strength of links, hierarchy, or other visual arrangements. However, measuring the diverse information of individual concept maps by hand is very time consuming, and almost impossible for larger sets of data. Additionally, to guarantee high reliability and validity, every human rater must be an expert in the subject domain in question and in the application of quantitative and qualitative assessment strategies (Taricani & Clariana, 2006). Therefore, the automated analysis procedure of the *SMD Technology* calculates quantitative indicators of concept maps, which then can be used for further statistical computations.

So far, the *SMD Technology* has been applied in different fields of mental model research. Ifenthaler (2006) investigated the trajectory of mental models constructed by subjects working on complex problem solving tasks. An HLM analysis of three quasi-experimental studies (N = 106) showed a significant increase of propositions when subjects worked for five hours in a multimedia learning environment (*Surface Structure*). Accordingly, as long as new information is subjective plausible it will be added to a person's knowledge structure. Further results indicate a significant increase in the diameter of the externalized knowledge structures (*Matching Structure*). Consequently, we found not only a significant learning-dependent increase in the number of propositions, but also a significant learning-dependent increase in structural complexity.

In order to investigate the learning-dependent progression of novices' mental models to more expert-like models, Ifenthaler (2006) compared the semantic similarity of externalized knowledge structures of novices with expert knowledge structures in different subject domains. The results of the *Deep Structure* indicator of the *SMD Technology* revealed a significant increase in similarity between novice and expert models. However, further HLM analysis indicated that the learning time of five hours was not long enough to integrate all information provided and consequently to gain higher similarity to an expert's solution of a problem. Additionally, the provided learning materials and feedback could be improved for further experiments.

Ifenthaler et al. (2007) investigated the role of cognitive learning strategies and intellectual abilities in mental model building processes using the *Deep Structure* indicator of the *SMD Technology*. The results indicate that the training of mental model building skills is a complex problem which should be investigated further with regard to the roles of conditions based on the theory of mental models (Seel, 1991).

Additionally, the *SMD Technology* has been used to investigate sharedness among team members (see Johnson et al., 2006). The focus on individually constructed concept maps and team re-representations can help to identify problems of team performance and lead to a better understanding of the complex performance processes within teams. Thanks to the flexibility of the *SMD Technology*, other indicators can be easily implemented in order to produce specific measures for a large number of research questions.

SMD Technology & Learning and Instruction

In the following, we will focus on the application of the *SMD Technology* for *knowledge diagnosis*, *self assessment*, and *knowledge management*. Other applications in the field of learning and instruction, such as *analysis of navigation paths* in learning environments (see Dummer & Ifenthaler, 2005), could be discussed on another occasion.

In order to provide learners with the best possible learning materials, the instructor or an Intelligent Tutoring System (ITS) must be aware of their state of knowledge. In general, *knowledge diagnosis* is applied by collecting necessary information about the learner with the help of various tests. By integrating the *SMD Technology* or parts of it (graphical re-representation; quantitative indicators) either into a computer-based learning environment or other instructional settings, it can easily be applied for individual knowledge diagnosis. The *SMD Technology* has been implemented as a cross-platform application which enables an easy integration into a computer-based learning environment. Therefore, the instructional designer may choose which components of the *SMD Technology* should be applied for an adequate knowledge diagnosis. The quantitative indicators could provide instant longitudinal information about the individual learning process. The indicators (Surface, Matching, and Deep) provide multiple information about changes in the knowledge structure and domain-specific knowledge acquisition. Depending on the results of the *SMD Technology*, the learning environments will provide specific feedback or other instructional materials to foster future learning processes (see Ifenthaler, 2006). On the other hand, the graphical re-representation of the *SMD Technology* can be easily applied for individual feedback on specific tasks. The instructor could use the re-representation at a specific point during the learning phase to discuss the strength and weaknesses of a learner's learning process. Additionally, the similarity and contrast model provide further feedback materials.

Another use of the *SMD Technology* in the field of learning and instruction could be various fields of *self assessment*. As self assessment has the ambitious goal of making judgments about a learner's own learning process, the feedback of an automated system should be very sensible to changes in the learner's knowledge structure. As discussed above, the quantitative indicators and/or graphical re-representations of the *SMD Technology* could be applied for self assessment. A learner could receive quantitative information about his or her learning progress after working for a defined period with a computer-based learning environment. Additionally, the graphical re-representation could provide descriptive information about the learner's knowledge structure. Furthermore, the similarity and contrast representation could elicit differences between previous points during the learning process or other learners or experts. This feature could therefore easily help to avoid the construction of misconceptions during self assessment phases. The major advantage of the *SMD Technology* for self assessment is the automated and instant generation of desired results. When learners receive the results of self assessment directly, their motivation to continue with the learning environment may be obtained longer than with other options of self assessment.

Finally, the *SMD Technology* could be applied for analysis of *knowledge management* processes. Individuals may use the quantitative indicators and or the graphical re-representations to compare it with other team members while working on a project. Also, the affordances of a task could be compared with the individual understanding of the task and gaps could be identified to solve it effectively. Another application of the *SMD Technology* for knowledge management could be the communication of individual or group knowledge for better cooperation and understanding with other members or groups of a project team. Further applications could include knowledge identification, knowledge use, and knowledge generation (see Tergan, 2003).

Conclusion and Further Perspectives

The new developed *SMD Technology* is based on the theory of mental models (Seel, 1991) and graph theory (Harary, 1974) and captures key latent variables associated with human learning and cognition. Graphical representations such as concept maps or natural language expression can be analyzed on three different levels. These levels help to describe individual knowledge structures from a relational, structural, and semantic point of view. Additionally, graphical re-representations of the *SMD Technology* provide further information regarding the externalized knowledge structures of a person.

The objectivity, reliability, and validity of the computer-based and automated *SMD Technology* were investigated in three quasi-experimental studies. The results show a high reliability and validity in all indicators. Based on our findings, we developed further ideas for developing new features for the *SMD* Technology. These developments will include a tool for constructing concept maps, new techniques for describing the constructed models, and automated statistical reports.

Nevertheless, the *SMD* Technology or parts of it (graphical re-representation; quantitative indicators) can be easily integrated into various applications. The tool can be used not only in mental model research, but also in various fields of learning and instruction. Beyond this, such computer-based and automated instruments could also prove to be beneficial in a wide span of other fields of research on technology and instructional development.

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Designing Online Instruction that Develops Critical and Creative Thinking Skills

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Abstract

Critical and creating thinking concepts are defined using Bloom's Taxonomy (1956) and the Garrison, Anderson and Archer (2000) "community of inquiry" model. The authors identify the relationship of cognitive presence with critical and creative thinking. The purpose of this paper is to identify and summarize the best practices associated with designing instruction that helps to build the critical thinking skills for online students. Selected literature related to building critical and creative thinking skills through online environments are reviewed. The authors then provide three examples of instruction from online courses at one south-eastern university that reflect the best practices noted for developing critical and creative thinking skills for both undergraduate and graduate level online courses.

Moving teaching and learning to an online environment can pose many challenges. This is especially true when there is a need to develop students' critical and creative thinking skills while in an online course. Critical thinking involves logical thinking and reasoning including skills such as comparison, sequencing, cause/effect, deductive and inductive reasoning, predicting, planning, and critiquing. In order to develop critical thinking skills in students, research has shown there is a need to develop instructional content and teaching styles that help to develop students' reflective, creative and self-guided learning (Garrison & Anderson, 2003; Boris & Hall, 2005; Bloom, 1933) . Online courses currently rely heavily on text-based information to provide instructional content and communications with students. In addition to providing well written text-based content and using sound questioning techniques, educators need to know if more can be done to develop higher-order thinking skills of students through the organization and design of the online course. Educators would benefit from a summary of best practices that help to identify organization, questioning, practice and instructional techniques that will develop critical thinking skills for students in an online environment. Therefore, the primary focus of this paper is to identify a list of "best practices" when moving online students above the application level of the cognitive domain and on to the levels of learning where the student can develop skills to evaluate and create new knowledge.

This article provides a basic description of critical thinking. Current literature is summarized to identify the "best practices" for developing critical thinking skills in an online course. Three different examples of instruction that are used in online courses to develop critical and creative thinking skills for online students at one university is explained.

Literature Review

Benjamin Bloom (1956) and his colleagues developed a classification system that helps to depict the cognitive domain. This classification is known as “Bloom’s Taxonomy” (see figure 1). The cognitive domain involves knowledge and the development of intellectual skills. This includes the recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills. Bloom included the following categories of intellectual skills in his original taxonomy: knowledge, comprehension, application, analysis, synthesis, and evaluation. His taxonomy represents the levels of knowing that a learner progresses through as they begin to develop higher order thinking skills. These categories of knowing can be thought of as degrees of difficulties. That is, the first level must be mastered before the next one can take place. However, learners do not move through the levels of knowing strictly in a linear fashion. Students need a foundation in which to build knowledge on. However, as the students acquire new knowledge and inevitably ask more questions, they need the flexibility to step back to the first level of knowledge building at any point in the learning process. Therefore, as learners develop skills or knowledge, they can move on to the next level to develop new intellectual skills or, if needed, they can repeat any previous levels.

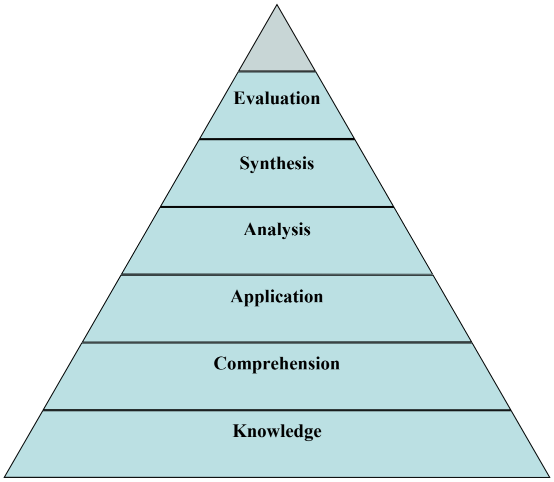


Figure 1
Bloom’s Taxonomy (1956)

Bloom's work is still very relevant to current theories. Anderson and Krathwohl revised Bloom's original taxonomy by combining both the cognitive process and knowledge dimensions. Anderson and Krathwohl (2001) made modifications to Bloom’s original taxonomy to come up with a revised taxonomy of the cognitive domain presented in figure 2.

The “revised taxonomy” includes all of Bloom’s classifications from the 1956 model as well as a new category described as “creating” new knowledge. The new taxonomy now includes both critical thinking (evaluating) and creating new knowledge as the highest categories of knowing. The new classification of “creating” includes learning activities such as generating, planning, or producing new information or knowledge. This new expanded taxonomy is helpful to both instructional designers and educators to write and revise learning objectives that including developing critical and creative thinking skills.

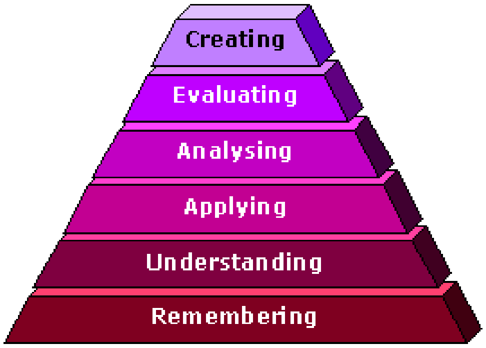
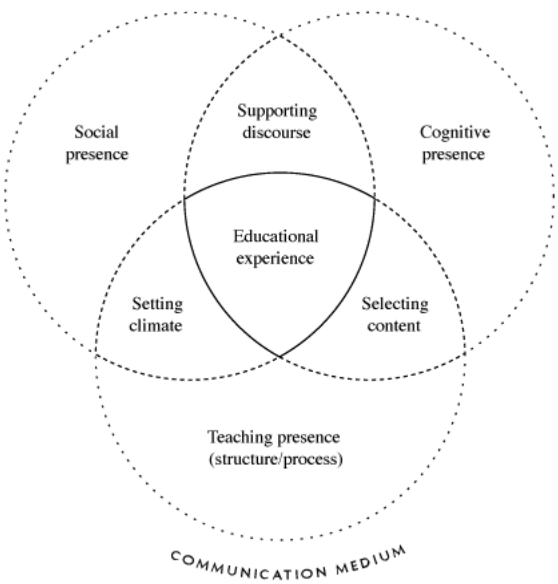


Figure 2
Revised Taxonomy (2001)

When educators use either of these taxonomies to plan instruction they may find that they generally are planning instruction that covers the first two or three levels of learning: knowledge, comprehension and application. However, some may find that they really have not developed instruction that will move students into higher order learning that demonstrates analysis and above. Educators should plan to provide opportunities for students to review their basic knowledge, comprehension, and application abilities and then the instructional/practice opportunities should then move the students into the higher levels of knowing that include synthesis, evaluation and creating new knowledge.

Online learning has the properties and tools needed to support higher-order learning and create the cognitive presence congruent with deep and meaningful learning outcomes (Garrison, 2003). The asynchronous and virtual nature of online learning calls on learners to be self-directed and to take responsibility for their learning. By offering instruction online, students will be able to participate in a more self-monitored learning environment that offers flexibility to the student as well as increased access to information. Therefore it is important for instructors to utilize the online course tools that are generally available through various course management systems such as: online discussion board, chats, groups, blogs, wikis, etc., to encourage students to be involved in their own learning process through the establishment "presence". To help to demonstrate this, Anderson (2004, ¶3) summarizes that Garrison, Anderson and Archer (2000) conceptual model of online learning that is referred to as the "community of inquiry" model:

Figure 3 Community of Inquiry



This model postulates that deep and meaningful learning results when there are sufficient levels of three component "presences." The first is a sufficient degree of cognitive presence, such that serious learning can take place in an environment that supports the development and growth of critical thinking skills. Cognitive presence is grounded in and defined by study of a particular content; thus, it works within the epistemological, cultural, and social expression of the content in an approach that supports the development of critical thinking skills. The second, social presence, relates to the establishment of a supportive environment such that students feel the necessary degree of comfort and safety to express their ideas in a collaborative context. The absence of social presence leads to an inability to express disagreements, share viewpoints, explore differences, and accept support and confirmation from peers and teacher. Finally, in formal education, as opposed to informal learning opportunities, teaching presence is critical for a variety of reasons.

Cognitive presence, social presence and teaching presence are all important preconditions in helping the learner to feel comfortable in the learning environment. Garrison stated that establishing cognitive presence online represents a significant shift in the design and delivery of an educational experience (2003). As such, the guidelines for designing instruction that develops effective learning online require a significant shift in the educator's thinking. Educators must move away from information dissemination to one of collaboratively constructing meaning and understanding (Garrison, 2003). The practical challenge then is to design the learning activities that provide the right balance and integration of reflection and collaboration.

In order to develop students' critical thinking skills in an online environment, Garrison reports that there are two very important effective practices that must be developed in an asynchronous online course: 1) Provide students the opportunity to reflect; and 2) Provide students the opportunity to collaborate with others, (2003). Through reflection, instructors must use written communication effectively, and provide learners the opportunity to revise and refine their comments and ideas. Reflection has to do with the state of learning and a learner's own knowledge, experiences, and thought processes (Dewey, 1933). To Dewey, learning was inducing reflection through questions and actively monitoring this inquiry for the purpose of achieving understanding (1933). Critical thinking is generally agreed to include the evaluation of the worth, accuracy, or authenticity of various propositions, leading to a supportable decision or direction for action (Jones, 1996).

This type of reflection is normally referred to as *metacognition.* Metacognition is an important concept in cognitive theory. "Metacognitive skills include taking conscious control of learning, planning and selecting strategies, monitoring the progress of learning, correcting errors, analyzing the effectiveness of learning strategies, and changing learning behaviors and strategies when necessary," (Ridley, D.S., Schutz, P.A., Glanz, R.S. & Weinstein, C.E., 1992). Metacognition consists of two basic processes occurring simultaneously:

1) Students monitor their progress as they learn, and
2) Students make changes and adapt their learning strategies if they perceive they are not meeting their learning goals.

Metacognition is about self-reflection, self-responsibility and initiative. Metacognition refers to knowledge of one's own thinking processes and products or anything related to them. It is "thinking about one's own thinking. At the same time, students must be responsible for goal setting and for managing their own time.

Perhaps the most effective practice in establishing an online cognitive presence congruent with higher-order learning is for the teacher to model reflective inquiry (Garrison, 2003). This is best done with the teacher objectively providing commentary and insight into their thinking process (i.e., thinking out-loud). The purpose is to increase metacognitive awareness – as stated above, a precondition for critical thinking and self-direction. Modeling reflective inquiry provides learners with concrete examples of how to approach subject matter for purposes of constructing personal meaning. Students learn how to manage and monitor their own learning. They gain the ability and confidence to be self-directed learners. In this regard, the teacher must participate in, but not dominate, discussions.

Modeling reflective inquiry and increasing metacognitive awareness can be greatly assisted by explicitly sharing a model of the thinking and learning process such as practical inquiry. Insight into the phases of inquiry and learning can help the learner appreciate whether they are in a problem definition stage, searching for relevant information, connecting ideas for meaning, or confirming understanding. Metacognitive awareness provided by such models can be an important tool in acting confidently and effectively through the selection and employment of appropriate strategies. This combined with teachers sharing their thinking process can be of considerable help to learners to develop metacognitive strategies and abilities and become reflective, self-directed learners.

The first challenge is to establish a community of inquiry in the online environment where learners feel connected and are cognitively engaged; and where there is a community that supports and encourages ideas to be critically analyzed and meaning negotiated. The discourse, however, must be purposeful and focused. The instructor must be able to interject new ideas, diagnose misconceptions, and move the discussion toward resolution that may or may not be predictable. The role of the instructor (as the facilitator) "goes beyond a neutral weaving of participants' contributions" (Garrison & Anderson, 2003). Clarifying, explaining and summarizing are legitimate functions of a facilitator. As long as this direct intervention is constructive, open communication is not threatened. Garrison states, "lecturing online or simply providing access to information is a complete misuse of asynchronous learning networks," (2003).

One important technique to use in an online environment is to allow students to moderate their discussion in small groups. This will actively engage most learners in a committed and free manner. The key is for students to report back their progress or conclusions. In this way, they receive appropriate feedback from all participants and confirmation of their understanding. By providing this increased responsibility and control, learners are encouraged to become more self-directed. The same technique can also be used for group projects, which is an excellent way to have learners collaboratively apply their new knowledge.

Finally, the use of online discussions can be very productive tools when used to develop critical thinking skills of online students. When instructors select a critical thinking strategy to use during online class or small group discussions, it is important for the instructor to frame the entry of the discussion so that students are able to focus their postings to the discussion topic and encourage students to offer deeper dialogue that contributes to the discussion. Collison, Elbaum, Haavind and Tinker confirm that instructors should inform students of the standards and expectations of discussions before the online discussions begin. Also, identify and highlight productive lines of discussions when they occur. Also, instructors should provide examples of previous discussions as good models of online discussions whenever appropriate. Instructors should use re-direction strategies to keep the focus of the discussion on the topic at hand (2000).

Best Practices Summarized

Developing critical thinking in an online course is different from developing these same skills in a face-to-face course simply because of the online tools that are utilized to communicate and share instructions and feedback with students. When designing the online course, educators need to be familiar with the online instructional and communication tools that are available and utilize the tools in order to implement the *best practices* of developing critical thinking skills for students online. Educators can use many of the course management tools such as group sites, blogs, discussion boards, and file exchanges to help to develop higher-order thinking skills of their students.

Here is a list of the top ten best practices as they can implemented through the use of course management tools that are generally available in online course:

Best Practice	Course Management Tools	Uses for Building Critical Thinking Skills Online
1. Communicate current information and resources to learners regularly throughout the course.	Announcements page, Introductory Modules, Discussion Board	Demonstrate active instructor participation, share expectations with students, provide navigational instructions, inform students of current information and resources; serves as a motivator to students by keeping information current
2. Share expectations of students' need to build *metacognition skills* in the first week of class	Introductory Modules, Discussion Board	Metacognition is an important concept in cognitive theory. State early in the course the expectations of students to take a conscious control of their learning, monitor their own progress, and selecting strategies to help them to learn
3. Provide a well organized and resourceful online learning environment that explains content clearly	Learning Units and/or Modules	Organize content, resources and assignments into learning units or modules provides consistency in layout of information; Instructor's can provide examples and a "reflective" model of the process the students will experience and help to explain abstract concepts as they come up in the course
4. State learning objectives and expectations from the beginning	Learning Units and/or Modules	Communicate to students what they are expected to learn and how their learning will be evaluated (provide rubrics when appropriate)
5. Provide opportunities to students to build and/or review foundation knowledge on their own when needed	Online Assessments/Quizzes	Provide students immediate feedback in knowledge/comprehension/application levels of intelligence; Students can self-monitor and moderate behaviors as needed to learn
6. Engage students in processing their thoughts through "reflections"	Blogs, Online Journals	Engage students in processing thought through opportunities to reflect on their learning throughout the course; Provides the instructor a means for sharing feedback to individual students (adding comments to individual postings and keeping it confidential)

Best Practice	Course Management Tools	Uses for Building Critical Thinking Skills Online
7. Question students regularly about their “thought process”	Discussion Board; Blogs – Asynchronous Communication Or Live Chat Session – Synchronous Communication	Used for engaging students in thought process; Use of questioning techniques that encourage critical thinking can be implemented; Allows time for students to “look up” references and information and respond within a given time frame; Allows for open communication for students to ask questions, respond to other views; Encourages active participation of student and instructor alike; Could serve as a motivator for learning
8. Provide the means of building peer relationships, online interactions, and opportunities to collaborate with others online	Groups Page (using the group discussion board and group file exchange tools), Wikis (team web sites)	Provides means of communicating and working with other students online to complete assignments and/or projects; Provides the instructor a means for sharing feedback with group members where only the active group members can see the information
9. Provide feedback and guidance to students (requires active instructor participation each week)	Assignments and Safe Assignments; Group Discussion Boards, Class Discussion Board	Used for submitting students’ work; Instructors can provide feedback and guidance on specific assignments/participation to students
10. Model the learning process whenever possible	Learning Units and/or Modules or Discussion Boards, Wikis, or Blogs (journals) devoted to modeling process and instructor reflections	Instructor’s can provide examples and a “reflective” model of the process the students will experience; Use concrete examples to demonstrate processes and/or abstract concepts
11. Provide Critical Thinking Rubrics	Display within Modules folder or in Course Documents command button	Allow the students to see how they will be evaluated in demonstrating Critical Thinking in the course and/or assignment

Three Examples: Developing Critical Thinking Skills in Online Courses

Example 1: Online Graduate Level Library Science Course
Genre: Modern/Contemporary Fiction

Objective: The objective for this assignment is for LIB 501/701 students to engage critical thinking based on a mini-author study focusing on Gary Paulsen and his books. And to find similar books based on Paulsen’s titles to motivate students to read other authors.

Some verbs used for indications of critical thinking are based on Bloom’s Taxonomy for Educational Objectives. Some examples of these verbs include

- Compare, contribute, deconstruct, organize
- Double check text, critique, judge base on criteria, justify statements based on text and other evidence
- Design, create, plan, produce

Mini Author Study: Author studies are an interesting teaching method for engaging readers, of all ages, in making connections between the author’s life and the books they write. An interesting question to ask is who are authors? This question is a board question that allows readers, of any age, to investigate the lives of authors as real people and find the challenges, successes, and other interesting aspects about authors. Also, an author study allows readers to seek out other books by the same author or similar type of books by other authors. Finally, investigating authors may motivate readers to write.

Post to the discussion forum: Gary Paulsen and his books.
Remember to post your initial response and then engage in conversations on three different days with at least one response to others.

Example 2: Online Undergraduate Level Communication Course
Communication Group Critical Thinking Assignment:

Many times in this class and others, you have been asked to be problem-solvers. Often this is done as an assignment. It may be a case study in which certain conditions are given you that are part of a problem – perhaps in an office or a company. You are asked to suggest solutions to the problem that is already stated.

In this assignment, the assignment will be somewhat reversed. It has been said by many that in the world of work, we need not only problem-solvers, but problem-finders or problem-recognizers. In other words, your group will predict a problem. The problem has not happened as yet. We know that many very successful organizations and companies are successful because they do not wait until something bad happens or there is a major problem. Instead, people in the organization identify the potential problem before it significantly inserts itself into operation of a company, team, process, etc. Others find something happening and identify a reason why a negative situation/event will occur if that is left unattended. In other words, a clue is discovered that influences the system negatively somewhere down the line. For example, an employee might note that if the process for manufacturing widgets continues as is, fewer and fewer widgets will meet tolerance standards. His fellow employees note that "if this continues, fewer good widgets will be made and there is going to be a big problem with output and the future of this company." Therefore, a clue has been identified and a problem has been predicted to occur from that clue. Another real world example involves the storing of credit card information on laptop computers by credit card companies. "If that computer is stolen, thousands of credit card holders could suffer false charges." Again, a major problem has been predicted based upon a clue or indicator.

Your task as a group is to identify existing circumstances that could lead to a major problem involving some aspect of communication. Look for events in the world news, in the state, in Richmond, on campus. Your group will list the "clues" or circumstances that could lead to a problem. The potential problem must have a communication aspect to it. state the sources for your "clues,"

Example: At Disney World and Disneyland, it was noticed by Disney scouts that because certain rides were so popular, they produced a long line of people waiting (and complaining). What was the problem? People didn't stop waiting nor did they stop going to the ride. Did they enjoy themselves as much as if the line was short? Probably not. Disney folks, however, saw this as a problem – a problem for "the happiest place on earth." So, they provided several solutions. First, they "snaked" the line of people. That is, they no longer put them into a straight line where each person just saw the back of the person ahead of them. Instead they wound them back and forth so that each person's view changed and gave the impression of moving (making progress toward the ride). They also provided shade and a gentle water mist at certain points in the line to relieve people from sun and heat. They also provided (at a cost) water bottles that sprayed a mist and directed it with a fan. Finally, they created the "fast pass" that allowed those who wanted to, a ticket with a stated hour when they would be able to go to "the head of the line." Get your fast pass in the morning for 2 PM in the afternoon and you were able to avoid a long line for your ride. Notice here that the "problem" was discovered through observation. Ultimately, the solution had an effect on people's satisfaction and was frequently communicated to others that were selecting a place to vacation.

Example: Recently, Jerry Lewis held his traditional Labor Day telethon for MD. During the program he uttered a "gay slur" as a part of a joke. Likewise, a cast member of "Grey's Anatomy" use an anti-gay term in reference to a fellow cast member during a public interview. In another case, a radio talk-show host used a derogatory term on air describing the members of a black women's basketball team. These incidents upset many people. A question - does this communication indicate a real anti-gay or anti-black belief on the part of the person who told the "joke" or said the words. What is the effect of such utterances? Given these circumstances and events, is there a problem and, if so, what part of the problem can be contributed to communication.

Your task:

- Select a group leader and consider roles to establish for the task.
- Explore internet, news magazines, niche magazines, your observations, and/or your environment for potential problem situations or issues. The task is to find instances (clues) to a problem in the making. If it has been stated and acknowledged as a problem already, you are too late. For example, parking at EKU has been a stated problem to the extent that there has been a study and a parking master plan to solve the stated problem. Therefore, this will not qualify as a problem for this particular assignment.
- As a group, decide on the potential problem that your group will identify.
- Classify the communication clues and analyze the potential problem as to what your group believes to be its causes. For example, a cause or clue to the impending problem may be a wrong or unreliable source of information, the lack of a qualified receiver, an unclear message, a wrong channel, or a lack of feedback (see Chapter 1 in your text to review other aspects of communication that may contribute to a problem).
- Record (and cite the sources for) your "clues" to the potential larger, more comprehensive, problem.
- Carefully define the "problem."
- Recommend three different solutions to the problem. The solutions will be the product of your group's thinking.

Prepare your analysis either in a paper or in a Wiki by using the Blackboard Wiki Tool.

Example 3: Orientation Course – First Year Students
Case-studies and branching scenarios

Case-based e-learning challenges learners to gather information from various sources in order to make meaningful decisions. Information can be structured in any format such as text, graphics, hyperlinks, audio, or video. The case format encourages students to look at an issue from multiple perspectives and helps to develop their decision making abilities. Branching scenarios can be included in the case to enable learners to see the consequences of their decisions, making the experience more memorable and effective.

Instructional Product: Students, serving as peer advisors, will analyze information presented in a specific case, access appropriate information and/or resources and engage in problem solving techniques.

Overview of Instructional Process:

- In this sample, the learner plays the role of a peer advisor. To make a correct analysis and recommend appropriate actions to their classmate, the learner must review relevant information about the student's history and current academic situation. Next the peer advisor must collect information or access resources that will help the "advisee" while using problem solving techniques.
- The information resources are presented as simple text, but could easily be augmented to incorporate graphics, audio, video, or external resources, such as patient charts.
- Learners will be "reflective" in their decision making process and demonstrate metacognitive skills as they progress through the case and problem solving activities.

Conclusion

Educators can promote critical thinking skills by developing course materials and activities that reinforce metacognitive skills. Educators who want to develop student critical thinking skills will need to develop a learning environment (online) that encourages students to ask questions, engage in reflective thinking and self-directed learning. At the same time, if is very important for the educator to model the reflective skills needed. Finally, the online discussions are important tools used to develop critical thinking skills for online students. Therefore, instructors should continue to seek out effective strategies and online tools that are used in developing rich and thought provoking discussions and reflections with their students online. Distance educators should work with instructional designers to develop online content and instructions that foster critical thinking skills.

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Developing a Cognitive Presence Scale for Measuring Students' Involvement during the e-Learning Process

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Cognitive presence, a sense of "being there" cognitively, has recently been considered an important factor for students' engagement in e-learning. There is, however, no widely accepted quantitative measurement scale for cognitive presence because most studies on cognitive presence have been conducted qualitatively. Therefore, existing theories on cognitive sector-related research regarding cognitive presence were reviewed and a new measurement scale for cognitive presence was developed. This study tested reliability and validity of the measurement scale of cognitive presence with 305 undergraduate students. Three major factors of cognitive presence were perceived levels of: 1) understanding content, 2) constructing knowledge, and 3) managing learning resources.

Introduction

Cognitive presence, a sense of "being there" cognitively, has been mainly researched by constructivists who stated that cognitive presence reflects higher-order knowledge acquisition and application in online learning (Garrison, 2004). Cognitive presence is also an important factor in facilitating learners' engagement and in affecting a learner's level of achievement and satisfaction (Wang & Kang, 2005; Kang, 2005).

Despite the importance of cognitive presence for successful online learning, there is no widely accepted measurement scale. Therefore, a new scale for measuring cognitive presence was developed based on the review of existing theories on the cognitive factors activating learners' engagement in an online learning environment. Then, reliability and validity of the new scale were tested with 418 undergraduate students in an e-learning environment. In this study, the developed scale was retested with 305 undergraduate students in online environments.

Theoretical Background

Studies related to online learning have begun to shift their focus to better understand the unique needs associated with online learners. The shift is increasing the importance of cognitive engagement in online learning (Richardson & Newby, 2004). One of the crucial factors for engagement in online learning is considered to be the level of perceived cognitive presence (Wang & Kang, 2005). In other words, engaged learners might have a higher level of perception of cognitive presence in an e-learning context.

According to cognitive engagement theory (Ryan & Patrick, 2001; Bangert-Drowns & Pyke, 2002; Wang & Kang, 2005), there are three characteristics that engaged learners might share: understanding, constructing, and self-regulating in knowledge construction. First, a high level of cognitive presence should be able to facilitate information acquisition, information transportation, and constructing knowledge (Corno & Mandinach, 1983; Wang & Kang, 2005). According to the cognitive engagement theory, knowledge construction has three factors: information acquisition, information transformation and constructing knowledge (Corno & Mandinach, 1983; Wang & Kang, 2005). Based on this theory, a high level of learners' perceived cognitive presence could facilitate knowledge construction (Wang & Kang, 2005).

Second, learners with a high level of perceived cognitive presence understand learning contents well. According to the cognitive engagement camp, cognitive engagement is the mobilization of cognitive strategies for interpretive transaction (Bangert-Drowns & Pyke, 2001). In other words, engaged learners are thought to be more intellectually concerned with their learning tasks intensively and extensively (Bangert-Drowns & Pyke, 2002). Accordingly, students' engagement entails an intrinsically motivated involvement of the integrated cognitive process (Kearsley & Schneiderman, 1998).

Third, learners who perceive a high level of cognitive presence manage learning resources freely. Since cognitive engagement is considered a core variable in a well-developed self-regulating learning process, engaged learners will be able to manage well resources, environment and performance (Mckeachie et al., 1986; Pintrich & De Groot, 1990). Resource management involves the process of developing well-defined goals and scheduling the course to achieve the best results. Environment management is the development of a physical setting that is helpful to learners. Performance management includes self-effort, self-reinforcement and persistence (Mckeachie et al., 1986).

Learners' cognitive presence activating engagement in an online environment has been investigated from both constructivist and cognitive perspectives. Constructivists have defined cognitive presence as the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry (Garrison, Anderson, & Archer, 2000). They argued that knowledge is constructed by the circular process of triggering events, exploring, integrating, and resolving tasks during online learning (Garrison, 2004). Cognitive presence has also been empirically validated with respect to cognitive engagement within online groups as providing a theoretical background for measuring the cognitive engagement of online learning (Oriogun, Ravenscroft, & Cook, 2005).

The above discussion led to the extraction of three factors of cognitive presence: understanding content, constructing knowledge, and learning resources management. Accordingly, the operational definition of cognitive presence in this study was defined as the 'perceived level of general understanding, knowledge construction, and learning resources management during e-Learning.'

Methods

As a result of primary factor extraction of 18 items from a survey of 418 students, three dimensions of cognitive presence were verified. To improve reliability, this study was retested with 305 undergraduate students. They enrolled in an online course titled 'Design of College Life' in the fall semester of 2006 at a large university in South Korea. The class lasted for eight weeks and the cognitive presence scale was distributed to participants as an online survey during the fourth week.

The three main components of cognitive presence are the level of understanding content, constructing knowledge, and managing learning resources. Each component has sub-components with 9 items based on a theoretical framework.

First, the level of understanding the contents has three sub-components: 1) consistency between content and objective, 2) organization of content, 3) articulation of content (Broadbent, 1958; Gagne, Yekovich & Yekovich, 1993). For example, the following items were used; "I could organize what I learned with diagrams and graphs," "I could explain what I learned in class," and so on.

Second, the level of constructing knowledge has the following sub-components: 1) information acquisition, 2) information transformation, and 3) constructing knowledge (Corno & Mandinach, 1983; Wang & Kang, 2005). For example, the following items were used; "I could collect information related to the class," "I could make a connection between new information and what I already knew."

Third, the level of managing the learning resources has sub-components: 1) time management, 2) performance management, and 3) environment management (Ryan & Patrick, 2001; Zimmerman, 1990; McKeachie et al., 1986). For example, the following items were used; "I could do assignments by making a plan," "I could avoid any distractions while studying."

As presented above, 27 items with a five-point Likert scale were developed via an online survey. The items were analyzed by an expert for content validity and modified based on recommendations. The online survey was conducted and 305 responses were collected. Exploratory factor analysis (EFA) was performed to verify the emergence of the three dimensions of cognitive presence. Principal axis factoring method was used to extract factors. To rotate factors, direct oblimin rotation method was used.

Results

The results of EFA with 27 items yielded three factors: understanding content, constructing knowledge, and learning resources management. The reliability of these factors with Cronbach's coefficient alpha yielded .844, .809, .640, respectively. Six items showing loading lower than .40 were removed (Thurstone, 1947). As a result, 21 remaining items are reported in Table 1.

Table 1: Emerged factors of cognitive presence

Main components	Remaining Items	Factor loading	Cronbach's alpha
Level of Understanding the Contents	The content of class is that I usually want to learn.	-.402	.844
	The content of class is what I expected.	-.404	
	I think I can understand content of class good enough to draw diagrams and graphs.	-.541	
	I can reorganize what I learned my class.	-.734	
	I think I can outline what I learned my class.	-.655	
	I think I can explain what I learned my class.	-.612	
	I think I can discuss what I learned my class.	-.667	
	I think I can briefly summarize learning material.	-.723	
Level of Constructing the Knowledge	I usually search for extra materials related to the class.	.450	.809
	I feel I can select materials what I need.	.457	
	I feel I can collect the information related to the class.	.606	
	I feel I can use what I learned in the class to do assignment.	.645	
	I feel I deeply understand what I learned.	.507	
	I feel that I'm learning in this class.	.584	
	I'm getting new perspective through this class.	.495	
	I feel I can apply what I learned in reality.	.471	
Level of Managing the Learning Resources	I feel that I can do assignments as planed.	.468	.640
	I know how to be helped.	.454	
	I reorganize the material for the assignment, the course activity, and the discussion.	.463	
	I look for the comfortable environment that I could focus on my study.	.595	
	I feel that I could eliminate the obstacles that disturb my study.	.494	

Discussion and Implication

We performed a second validation process on this measurement of cognitive presence based on theory. According to studies on the cognitive engagement camp, cognitive presence is composed of three dimensions: level of understanding the content, constructing knowledge, and managing learning resources. In this study, the cognitive presence scale was grounded in theory and validated three constructs through statistical analysis as in the preliminary study.

Consequently, this study shows that cognitive presence activating learner's engagement consists of three dimensions and these could be a basis for measuring the level of cognitive presence. At present, a follow-up study is in progress to conduct a CFA (confirmatory factor analysis).

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A Direction of Instructional Theories for the Convergence of Information and Communication Technologies

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Abstract

Over the past two decades, the development of information and communication technologies (ICT) has moved educational systems from teacher-centered pedagogy to learner-centered pedagogy. The recent convergence of ICT has fostered another reform in education. Therefore, this article will examine the impacts of the ICT convergence on the current pedagogy, review the main principles of two current learner-centered instructional theories, and suggest potential modifications of these theories for the new pedagogy.

Introduction

Over the past two decades, the development of information and communication technologies (ICT) has resulted in significant changes in the global economy, referred to as globalization, the information society, and the knowledge economy (Kozma, 2005; Sachs, 2005; Tinio, 2005). This new technological global economy system has enormous implications for the nature and purpose of the entire educational system as well as other subsystems in the society (Abbott, 2001; Bates, 2001; Carnoy, 2004; Coupal, 2004; Dede, 2000; Lim & Hang, 2003; Lim, 2003; Mooij, 2004; Moore, Burton, & Myers, 2004; Molz, Eckhardt, & Schnotz, 2002; Tinio, 2005). Essentially, these educational changes have required a paradigm shift in instructional theories (Reigeluth, 1999). Thus, the focus of educational researchers and practitioners has moved from passive teacher-centered instruction to active learner-centered instruction (Bonk & Cunningham, 1998; Duffy & Kirkley, 2004; Reigeluth, 1999).

In the midst of these changes, a convergence within ICT has emerged. The convergence of cutting-edge technologies, combining different media into one operating platform (e.g., multimedia cell phones including digital cameras, MP3 players, and DMB systems), has resulted in another natural reform of instruction and learning in order to improve learner-centered pedagogy (Erstad, 2005; Kozma, 2005). As a key notion of this reform, knowledge-building communities through virtual learning environments have been proposed (Barab, Kling, & Gray, 2004; Bonk, Wisher, & Nigrelli, 2004; Hewitt, 2004; Kozma, 2005; Scardamalia & Bereiter, 1994). As part of these trends, this paper will examine impacts of the ICT convergence on learner-centered pedagogy and present suggestions for modifying current instructional theories to knowledge-building communities.

Another New Challenge to Instructional Theories: The Convergence of ICT

Traditional information and communications media were once separate, and their services (e.g., broadcasting, voice telephony, and online computer services) were operated on distinctly different platforms (e.g., TV and radio sets, telephones, and computers; NetTel, 2005). However, the current combination of ICT merges separate media into one operating platform and provides the different services as multi-services, including telecom, data processing, images and audio technologies. Recent examples of new convergent services are web TVs (TVs with internet services), multimedia mobile phones (cell phones with e-mail and WWW access, MP3 players, and digital broadcasting capabilities), and web casting (radio and TV programming on the Internet). This new ICT convergence is not limited to technology issues but has also resulted in the convergence of other social phenomenon such as functional, technological, economic, political, and geographic convergence (NetTel, 2005).

One of the most significant changes brought by this ICT convergence is to shift users from content/service consumers to content/service creators. New development and convergences of ICT have made personal technology tools smaller, lighter, cheaper, and more mobile and allowed their users (e.g., students in education) to be freer, opener, more collaborative and creative. Learners are no longer just passive knowledge consumers who adopt identical services provided by systems. Now, they can create, share, and use their own new knowledge as experts do, whenever and wherever, through the convergence of technologies (Barab, Kling, & Gray, 2004; Kozma, 2005). This can be identified as knowledge creation through the convergence of ICT.

Essentially, this new phenomenon requests another advanced pedagogical reform distinguished from learner-centered education. Knowledge building communities have been suggested as an ideal direction to this change (Barab, Kling, & Gray, 2004; Bonk, Wisher, & Nigrelli, 2004; Hewitt, 2004; Kozma, 2005; Scardamalia &

Bereiter, 1994). Knowledge building communities can be described in terms of key components of ICT and pedagogy, as shown in Table 1. However, it should be noted that this new notion of pedagogy still includes many important learner-centered pedagogical features because this notion has been developed based on the current learner-centered paradigm, while learner-centered pedagogy has been evolved in contrast to teacher-centered pedagogy.

Table 1. *Dimensions of teacher, learner, and community-centered educations related to ICT, adopted or modified from Bransford, Brown, & Cocking (2000), Erstad (2005), Hewitt (2004), Kozma (2005), Law, Kankaanranta, & Chow (2005), Scardamalia & Bereiter (1994), Srivastava & Venugopal (2005), and Voogt & Pelgrum (2005)*

	Teacher-centered education	Learner-centered education	Knowledge building community-centered education
Level of knowledge	Memorizing and understanding concepts, principles, and procedures outside of the context of the real world.	Deep understanding of complex concepts and transferring learning to the real world.	Creating new knowledge in the real world.
Way of communication	One to many (e.g., a teacher to students).	Many to many (e.g., students to students).	Massive to massive (e.g., community members to community members).
Nature of technology	Separate media (e.g., slides, radio).	Separate media and multimedia: the traditional convergence of ICT (i.e., computers and the Internet).	The new convergence of ICT: mobile and wireless access to the Internet (e.g., multimedia cell phones, PDAs).
Use of technology	No/limited use of traditional media.	Limited/flexible use of traditional media and multimedia.	Flexible use of the ICT convergence.
Leadership	No/limited strategies on media.	Limited strategies on media.	Breakthrough visions of development creating a new agenda for education.
Goals	Prescribed goals.	Overall goals.	Locally adapted.
Tasks	Fixed tasks in the scopes and sequences.	Complex tasks.	Open tasks set by students.
Methods	One-way transmission of information.	Project orientation and collaboration. Different approach adjusted to student needs.	Dependent on activities and goals, not predefined. Collaborative process of building on current knowledge to create. new knowledge
Assessment	Teacher-directed Summative assessment.	Teacher/student-directed Formative assessment.	Student-directed (e.g., self-assessment, peer assessment) Diagnostic assessment.
Student roles	Passive reproducer of knowledge, individually.	Producer of knowledge, individually and collaboratively.	Active creator of knowledge, collaboratively with good meta-cognitive skills.
Teacher roles	Active provider and transmitter of information.	Different roles related to activities (e.g., facilitator, expert).	Organizer of environments, knowledge challenger and learner.
Tools/Resources	Subject-oriented books	Combination of books	A wide variety of

	supporting skills; reading, writing, and calculating.	and different digital resources (e.g., hypertext, multimedia).	resources (e.g., games, simulations resources).
Learning environment	Traditional classroom during scheduled class time.	Traditional/beyond classroom during the course (e.g., off/online classroom).	New ways of organizing learning: breaking with school as the single organizing principle, virtual platforms for collaboration, no boundary between in and out of classroom, life-long education.
Knowledge building	Reproduction.	Production and inquiry-based.	Based on students ideas, knowledge creation and inquiry.
Instructional theories	Direct instruction, Garne's nine events.	Merill's first principle, problem-based learning, anchored instruction.	Knowledge-building community.

The convergence of ICT has accelerated the pedagogical move forward to knowledge building communities. Nevertheless, it has also provided all three types of pedagogies with three advantages as follows (Kozma, 2005; Voogt & Pelgrum; 2005; Tinio, 2005). First, regarding the quantity of learning, ICT expands access to education (i.e., access to remote learning resources anytime and anywhere). Second, in terms of the quality of learning, ICT promotes student understanding (i.e., active, integrative, and facilitating learning). Last, regarding the innovation of learning, ICT fosters knowledge creation (i.e., creating, sharing, and using knowledge). These positive effects of ICT on teaching and learning processes may be controversial. However, there is an agreement that, at least in principle, ICT helps learning become more effective, efficient, and appealing (Merriënboer & Brand-Gruwel, 2005).

As mentioned before, learners are not passive knowledge consumers or active knowledge transferors anymore, but now they are innovative knowledge creators equipped with high technology tools. The focus of learning has changed from knowledge acquisition to knowledge creation (Kozma, 2005). To face this new learning arena brought on by the ICT convergence, current instructional theories should be reconsidered. Thus, in the following section, I will review major principles of two instructional theories grounded on learner-centered pedagogy, problem-based learning (PBL) and anchored instruction (AI), to propose possible modifications.

Principles of Instructional Theories: PBL and AI

Two instructional theories, PBL and AI, have been selected because their goals, values, situations, and component methods are clearly identified (Reigeluth, 1999), and their importance and applications are still considerable in the new virtual and mobile learning environments (Steinkuehler, 2006 and in press; Steinkuehler, Derry, Hmelo-Silver, & Delmarcelle, 2002). The main goals of these instructional theories are to promote cognitive domain (e.g., self-directed learning, collaboration skills) in face-to-face learning in K-16 settings.

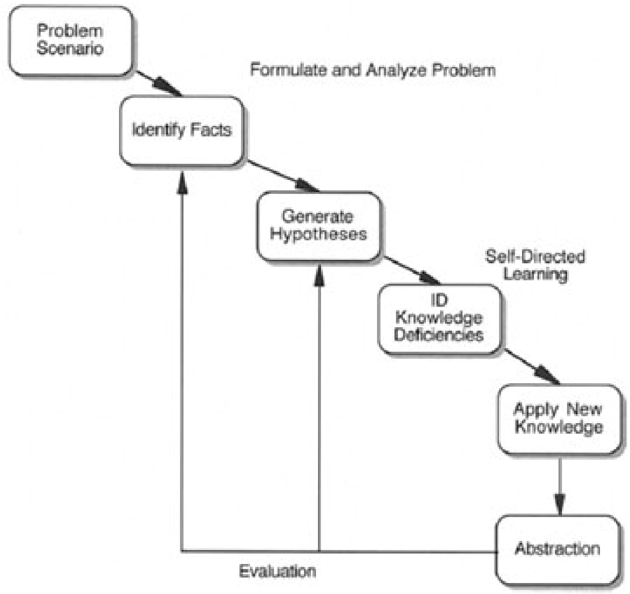
Problem-based Learning

Problem-based learning (PBL), originally developed in medical schools at Southern Illinois University in the early 1970s, is an instructional theory in which students learn through facilitated problem solving using the processes of investigation, explanation, and resolution (Barrows, 2000; Hmelo-Silver, 2004; Savery & Duffy, 1996). The main principles of PBL are presented in Table 2.

Table 2. *Main principles of problem-based learning, adopted or modified from Barrows (1994 and 2000), Barrows & Kelson (1995), Herrington & Oliver (2000), Hmelo-Silver (2004), Koschmann, Myers, Feltovich, & Barrows (1994), and Savery & Duffy (1996)*

	Main principles
Goals	• Develop effective problem-solving skills • Construct extensive, flexible knowledge bases • Improve intrinsic motivation • Develop self-directed learning skills • Improve effective collaboration skills
Problems (Tasks)	• Be authentic, complex, ill-structured, and open-ended • Raise concepts and principles relevant to contents • Focus on learning information and reasoning strategies • Promote conjecture and argumentation • Help students engage in the learning process with their initial understanding • Require multidisciplinary solutions • Foster communication skills • Help students build extensive and flexible knowledge
Methods/Processes (see Figure 1)	Facilitator • Present a problem scenario Students • Analyze the problem by identifying the relevant facts from the scenario • Generate hypotheses about possible solutions • Identify knowledge deficiencies relative to the problem during self-directed learning • Apply new knowledge • Evaluate the hypotheses in light of what students have learned • Reflect on the abstract knowledge gained
Assessments	• Self-evaluation
Student roles	• Learn what they should know to solve a problem • Bring new knowledge to group for application to problem • Work in small groups • Negotiate ideas • Reflect critically the relationship between their learning and problem-solving goals
Facilitator roles (Teacher roles)	• Facilitate learning process and model reasoning • Help students learn the cognitive skills needed for problem solving and collaboration • Be an expert in good strategies, not in the content • Scaffold student learning through modeling and coaching • Monitor students involvement • Encourage students to externalize their own thinking and comment on peers' thinking • Encourage students to test ideas against alternative views • Support students to develop ownerships • Guide higher-order thinking by justifying students thinking • Externalize self-reflection by directing questions to students
Tools/Resources	• Structured whiteboard • Student-identified learning resources
Learning environment	• Support and challenge students' thinking • Face-to-face classroom

Figure 1. *The problem-based learning cycle (Hmelo-Silver, 2004, p. 237)*



Anchored Instruction

Like another family of constructivist approaches including PBL and project-based science (Hmelo-Silver, 2004), anchored instruction (AI) was initially designed for K-12 students by Bransford and his colleagues in the Cognition and Technology Group at Vanderbilt (CTGV) in the late 1980s. AI refers to instruction in which learning materials (i.e., videodisc-based narrations) are presented in the context of the authentic events that serve to anchor learning (Barab, Hay, & Duffy, 1998). The Young Sherlock Project (language arts and social studies) and the Jasper Series (mathematics) are representative example projects of AI (CTGV, 1990, 1992, and 1997). The fundamental characteristics of AI are as listed in Table 3.

Table 3. *Main principles of anchored instruction, adopted or modified from Barab, Hay, & Duffy (1998), Bransford, Sherwood, Hasselbring, Kinzer, & Williams (1990), CTGV (1990; 1991; 1992; 1997), Hmelo-Silver (2004), Moore et al. (1994), and Kang (1994).*

	Main principles
Goals	• Overcome inert knowledge • Foster meta-cognitive skills • Promote cooperative learning • Build multiple perspectives
Stories (Tasks)	• Provide complex problems in videodisc-based narrations • Link across the curriculum • Present interesting, realistic, and macro context to encourage active knowledge construction • Generate many sub-goals (at least 15) • Embed all fact data necessary to solve the problem • Present major problems to be solved at the end video • Open-ended
Methods/Processes	Teachers • Present the video-based stories to support comprehension Students • Identify major goals of the given story • Generate sub-problems that represent obstacles to the goal • Devise strategies to deal with various sub-problems

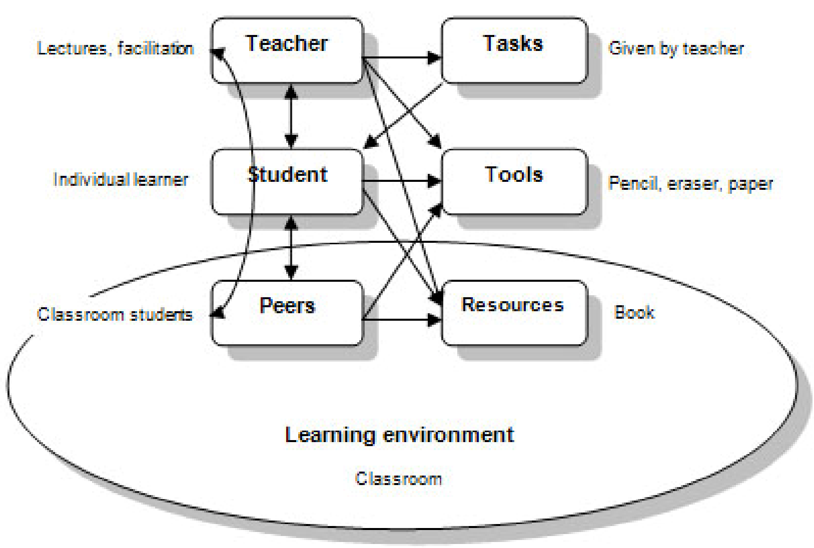
	• Find all relevant information presented throughout the story • Generate what students need to know • Retrieve the information from memory • Scan back on the video clip to see if information is accurate
Assessment	• Not specific mentioned
Student roles	• Find top-down strategies to generate sub-goals necessary to reach the final goal • Learn the lower level skills through • Reflect on their own perspectives • Negotiation of ideas and strategies within small groups and whole class • Examine problems from multiple perspectives
Teacher roles	• Engage students' prior knowledge • Model problem-solving strategies • Provide content instruction when needed by students • Guide planning and sub-goals generation
Tools/Resources	• Videodiscs, VCRs, and video controllers • Problem-specific tools (e.g., maps, pencils)
Learning environment	• Face-to-face classroom

A Direction of Instructional Theory Modifications: Knowledge Building Communities

This section will present suggestions for PBL and AI modifications in new learning environments opened by the ICT convergence regarding the difference between knowledge levels aimed in two pedagogies (deep understanding vs. knowledge creation). Also, in order to increase effectiveness, efficiency, and appeal of instruction, these modifications will focus on the new relationships among learners, teachers, tasks, tools, and resources in the learning environments, as well as instructional framework changes (e.g., type, control, focus, grouping, interactions, and support of learning; Reigeluth, 1999).

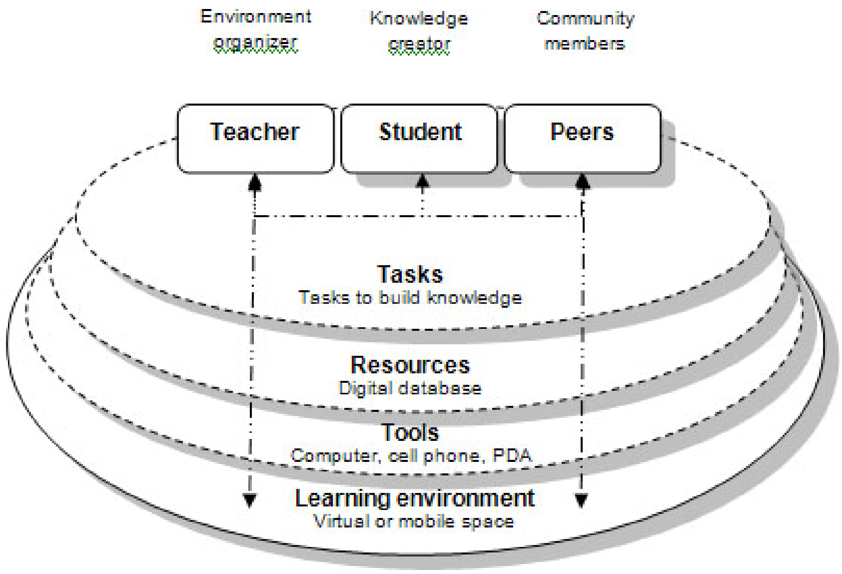
First of all, in terms of instructional elements, the structure of traditional PBL and AI in the classroom is represented in Figure 2.

Figure 2. *The original structure of PBL and AI in the classroom*



The new instructional structure of PBL and AI in the virtual and mobile learning environment for knowledge building communities is shown in Figure 3.

Figure 3. *The new structure of PBL and AI in the virtual and mobile learning environment for knowledge building communities*



As shown in Figures 2 and 3, there are meaningful differences among the relationships of elements in the two learning environments. Due to the nature of the virtual learning environment with Internet access and data searching (e.g., Google, Yahoo), it is ambiguous to separate tasks, tools, and resources from the environment (i.e., virtual vs. real world)[1]. Moreover, because of the smart mobile tools with wireless Internet services, digital cameras, and broadcasting systems (e.g., notebook computers, multimedia cell phones, PDAs), lining the boundary of a classroom or school is also worthless (i.e., in class vs. out of class).

For these reasons, whoever has these new combined tools can enter the learning environments any time and any place and learn or teach beyond traditional instruction. Thus, this new learning environment, open to the public, makes the distinction between information and instruction (non-formal vs. formal education) meaningless. In this sense, the notions of new learning systems created by the ICT convergence accord with the features of knowledge building communities. Meanwhile, the teachers' role is significantly reduced because teachers, who once delivered knowledge or facilitated students' learning processes in classrooms, now share their instruction or facilitation with new tasks, tools, or resources in the virtual and mobile learning environment[2].

Problem-Based Learning for Virtual Knowledge-Building Communities

There are several possible modifications for applying PBL to the new learning environment framework, virtual knowledge building communities. First of all, learners' ownership and empowerment should be more emphasized in the new PBL, as the members of knowledge building communities who share goals, values, and beliefs, learners should be able to create their norms, rules, or other orders (Bonk et al., 2004; Hewitt, 2004). Therefore, instead of instructional designers or facilitators, learners should participate in the process of designing PBL[3]. For example, learners can (a) select problems in their own real world, not given scenarios, (b) devise small teams in the community following their decisions, (c) allot generated hypotheses to each team considering their interest and expertise, (d) evaluate processes and products of solutions on their negotiated rules, and (e) reflect and provide feedback on the values of created knowledge according to their judgments. Through these active involvements in the decision-making process of communities, learners can have strong senses of identity and engage more in PBL learning activities (Carabajal, LaPointe, & Gunawardena, 2003).

Meanwhile, this empowerment of learners implies that the role of facilitators or instructional designers diminishes in significant ways. The focus of control in the new PBL does not belong to them anymore. Thus, their

[1] Dotted lines imply open-ended boundaries.
[2] No shadow means reduced teacher's role.
[3] This role change can be explained as the change of Division of Labor in the activity system of a knowledge building community (Hewitt, 2004, p. 217).

new main roles should be changed to environment organizers, knowledge challengers, or expert learners who contribute to knowledge creation as community members (Erstad, 2005).

On the other hand, discourse focusing on problems should be at the center of the new PBL in virtual learning environments. Community knowledge data are created by learners who participate in discourse activities (Scardamalia & Bereiter, 1994). In this sense, the ICT support should be designed to enhance reasoning and provoke critical thinking (Merriënboer & Brand-Gruwel, 2005; Merriënboer & Martens, 2002). Thus, it is essential to provide specially designed discourse environments (e.g., asynchronous bulletin boards, blogs) that can help learners construct their inquiry process in light of a problem rather than a topic (Scardamalia, 2003; Scardamalia & Bereiter, 1994). As the other benefits of this new ICT-based discourse, (a) eliminating turn-taking problems, (b) encouraging peer commentary and notification, and (c) opening entry points for all ages and ability levels can be obtained (Scardamalia & Bereiter, 1994).

Also, learners and facilitators should know how to think critically in discourse, which has been emphasized as one of meta-cognition skills for knowledge creation (Garrison, Anderson, & Archer, 2000 and 2001). For example, key critical thinking processes can be explained as guidelines before generating problems in the PBL (Garrison & Cleveland-Innes, 2005). These guidelines can help discourse participants realize how to identify the problem (e.g., trigger phase), how to expend their initial ideas through brainstorming (e.g., exploration phase), how to construct meanings from generated ideas (e.g., integration phase), and finally how to implement proposed solutions (e.g., resolution phase; Garrison, Anderson, & Archer, 2003).

In addition to cognitive presence of discourse, special strategies to enhance social presence of discourse should be designed in the new PBL because successful social networking among learners is a core of community evolution, especially in virtual environments (Carabajal, LaPointe, & Gunawardena, 2003; Riel & Polin, 2004). This notion should be increasingly considered in the case of broader communities that consist of massive members beyond classroom, school, or nation (Scardamalia & Bereiter, 1994).

Anchored Instruction for Knowledge Creation in Virtual and Mobile Learning Environments

Basically, the concepts about knowledge building communities aimed in new AI are the same to those in modified PBL. However, unlike modified PBL, the intervention of instructional designers or teachers does not decrease significantly in terms of prescribing stories to anchor the instruction (i.e., embedding fact data in the stories during the design process). For this reason, the scope and boundary of the new AI may not expand beyond the formal education systems, unlike the new PBL. Therefore, modification points for AI (anchored instruction) will be indicated only regarding technological aspects of AI (e.g., AI using smart virtual and mobile ICT equipments) instead of global community aspects.

First, up-to-date ICT should be used to improve instructional effectiveness and efficiency in AI (Dede, 2000; Merriënboer & Brand-Gruwel, 2005). For instance, cutting-edge ICT display tools can replace videodisc-based narrations as learning materials to present macro-contexts in AI. Stories and narratives are very appealing instructional methods because learners can easily associate with the contexts, plots, and elements manifested in them (Bruner, 1996; Hung, Tan, Cheung, & Hu, 2004). Thus, as one of the key instructional characteristics in AI, stories have values even in the new learning environments. However, in terms of the effectiveness and efficiency of instruction (Reigeluth, 1999), the story delivery should be updated by adopting new ICT tools, such as digital video clips through the Internet (e.g., YouTube.com) or MDB services through multimedia cell phones. With these new methods of delivery, learners can return to the stories anytime and anywhere and are not confined to a certain time and space by VCRs or TVs. This mobility can increase the possibility for learners to catch the final goal and sub-goals from the stories.

Also, in order to generate new knowledge, more creative activities for learners should be designed in the AI. Through the meaningful activities, learners can discover what they need to do to reach the final goal and accumulate what they find in the activity process as creative knowledge (Jong & Joolingen, 1998). For example, instead of embedding all fact data in the stories, only clues relevant to the facts can be presented. The clues should indicate clearly how and where learners can find all the fact data necessary to achieve the goal. To find these fact data, learners can go to the fields in their real worlds (e.g., vegetables in the grocery store, flowers in the garden) with appropriate mobile ICT tools (e.g., multimedia cell phones, smart PDAs with Internet access, and digital cameras) or search for the data in the Internet (e.g., Google, Yahoo). After finding the necessary data, learners can immediately upload, share, and use them in various data forms (e.g., digital photo images, movies, texts) through the mobile ICT equipments. These real, live, and confirmed data from the fields or the Internet are new knowledge created by learners. In addition, during the process searching for fact data in the real world, learners can foster their self-monitoring and meta-cognitive skills (Kang, 1994). Moreover, they can link authentic multi-knowledge across curriculum beyond given problem situations (CTGV, 1990 and 1992).

On the other hand, as addressed above, teachers or instructional designers should devise anchored stories with appropriate clues, considering available learning environments and tools. Also, teachers can be involved in the knowledge building processes with learners. Nevertheless, their roles are relatively reduced compared to the original AI.

Conclusion

This paper has examined the change of the current pedagogy informed by the new ICT convergence, reviewed the main principles of two learner-centered instructional theories (PBL and AI), and furthermore suggested the potential directions of modifications in these theories toward knowledge building communities.

Learners empowered by cutting-edge technologies refuse remaining as passive knowledge consumers. Now, they are moving forward to knowledge creators (Kozma, 2005). The convergence of ICT makes the boundary of physically separated learning environments, tools, and resources meaningless in instruction. Also, conceptual distinctions between virtual and real worlds, in and out-of classroom, and formal and non-formal education become vague. Nevertheless, the features of new learning environments brought by the ICT combination will satisfy the necessary conditions for the development of knowledge building communities.

Therefore, to face this new learning arena with great potential, current instructional theories should be improved in terms of effectiveness, efficiency, and appeal (Reigeluth, 1999). However, their modifications should be confirmed through designed-based research approaches in the fields (Barab, 2004; Reeves, 2000; Reigeluth & Frick, 1999; Richey, Klein, & Nelson, 2004; Wilson, 2005; Winn 2002). Also, the relationships between instructional methods and situations should be investigated to present alternative methods (Reigeluth, 1999). Finally, the identity and role of instructional designers as changed by this new learning pedagogy should be reseated and clarified.

Groups are social systems (Carabajal, LaPointe, & Gunawardena, 2003). From this perspective, the relationships of the various components in education should be carefully considered to reform the whole educational system and furthermore change the super-system, our society (Banathy, 1992; Dede, 2000).

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A Comparison among Facilitation Strategies to Promote Critical Thinking of College Students in Online Discussion

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Introduction

Why should we pay attention to critical thinking of college students? Developing critical thinking skills is essential in all K-16 educational settings. However, critical thinking has been emphasized in higher education more often because it is a prime aim of American postsecondary education targeted for future mid-career knowledge workers (Archer, Garrison, Anderson, & Rourk, 2001; Hagedorn, Pascarella, Edison, Nora, & Terenzini, Hegedorn, 1999).

Since the middle of the 1980s, many national reports such as Involvement in Learning (1984), Integrity in the College Curriculum (1985), National Education Goals Panel (1991), and National Goals for Education – 2000 (1994) have explicitly underscored critical thinking as an essential outcome of undergraduate education (Facione, Facione, & Giancarlo, 2000; Hagedorn et al., 1999). The key argument of these reports is that graduates should be equipped to deal with the demands of a rapidly changing work environment in the real word. However, this should be obtained through the acquisition of core skills to transfer across a wide rage of situations (i.e., cooperative, communication, and problem-solving skills merged into critical thinking skills) rather than through the memorization of factual information and specific content materials to become forgotten or outdated (Bennett, Dunne, & Carre, 1999; Tsui, 2000). In fact, the need for critical thinking skills in the work place has been reported through numerous surveys and interviews of employers who have a desire for graduates with these generic core competencies as personal transferable skills (Bennett, Dunne, & Carre, 1999; Harvey, Moon, & Geall, 1997; Slee 1989). Recently concurring with the pedagogical paradigm shift from teacher-centered to learner-centered education, the needs and attentions of critical thinking have enlarged at the center of higher education (Barab, Kling, & Gray, 2004; Duffy & Kirkley, 2004; Reigeluth, 1999).

How can we promote student critical thinking to achieve the ultimate goal of higher education as well as satisfy the needs for the work place? A number of educational researchers and practitioners have discussed that online group discussion through computer-mediated communication (CMC) can serve as a core to foster critical thinking skills, while simultaneously promote quantity and quality of group interactions (Angeli, Valanides, & Bonk, 2003; Archer et al., 2001; Garrison, Anderson, & Archer, 2000; Garrison & Cleveland-Innes, 2005; Henri, 1992; Hiltz, Coppola, Rotter, & Turoff, 2000; Jeong, 2001; Johnson, Johnson, & Stanne, 1986; Khan, 1997; Nachmias, Mioduse, Oren, & Ram, 2000; Newman, Webb, & Cochrane, 1995). In addition, the guidance of facilitators in online collaborative discourse has been emphasized as a helpful instructional strategy to cultivate students' critical thinking (Anderson, Rourke, Carrison, & Archer, 2001; Collison, Elbaum, Haavind, & Tinker, 2000; Duffy, Dueber, & Hawley, 1998; Lee, 2003).

Therefore, as a first step in designing the effective online facilitation strategies for critical thinking, this paper will identify the meanings and aspects of critical thinking and compare the current four online facilitation guidelines for critical thinking.

The Meanings and Aspects of Critical Thinking to Promote

Definitions of Critical Thinking

Critical thinking in literature has been defined in various ways associated with critical inquiry, critical reasoning, and cognitive presence (Anderson et al., 2001; Angeli et al., 2003; Angelo, 1995; Archer et al., 2001; Brookfield, 1987; Duffy et al., 1998; Lee, 2003; Pithers & Soden, 2000).

Critical thinking can be defined as "the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning or communication, as a guide to belief and action" (Paul & Elder, 2001, p. 371). From another perspective, Duffy, Dueber, and Hawley (1998) associated critical thinking with an inquiry process. They argued that a learner inductively or deductively solves his or her puzzlement through the inquiry process of generating a hypothesis, gathering and evaluating data, considering alternatives, and resolving for a rational solution. On some occasions, critical thinking and cognitive presence have been used synonymously. Garrison, Anderson, and Archer (2001) defined cognitive presence as "the extent to which learners are able to construct and confirm meaning through sustained discourse in a critical community of inquiry" (p. 1). In this way, various definitions and terms referred to as critical thinking to describe the focus of specific interests have coexisted in literature.

Nevertheless, there is a general consensus to distinguish critical thinking beyond this diversity. It is that inquiry is the key notion of critical thinking (Hagedorn et al., 1999; Henri, 1992; Savery & Duffy, 1995; Tsui, 2000). Based on the inquiry, critical thinking is explained as (a) a productive and positive activity, (b) a process, not an outcome, (c) a manifestation depending on contexts, (d) an event triggered by positive and negative stimuli, and (e) an emotive and rational response (Brookfield, 1987).

Components of Critical Thinking in Online Learning Environments

There are also many different models to explain the components of critical thinking in online conferencing. Interestingly enough, most of these models were originally developed to evaluate critical thinking levels as content analysis tools (Garrison et al., 2000 and 2003; Henri, 1992; Newman, Webb, & Cochrane, 1995).

First of all, Henri's (1992) critical reasoning skill stages in the problem-solving process are considered as a fundamental model. As critical thinking indicators, Henri's conceptual framework includes the following four key stages: (a) elementary clarification observing or studying a problem, identifying its elements, and observing their linkages; (b) in-depth clarification analyzing a problem to understand its underlying values, beliefs and assumptions; (c) judgment making decisions, evaluations, and criticism; and (d) strategies for application of solution following a choice or decision (Jeong, 2001, p. 12).

However, in terms of visualizing dynamic relationships of key critical thinking components in an online learning community, Garrison and his colleagues' Practical Inquiry model (2000, 2001, and 2003) is regarded as a representative theoretical framework (see Figure 1). Particularly, the notion of critical thinking in this Practical Inquiry model refers to *cognitive presence*, one of the three overlapping elements in the Community of Inquiry (i.e., *cognitive presence, social presence, teaching presence*; see Figure 2). We should notice that the relationships of overlapping parts among *cognitive, social,* and *teaching presences* can influence facilitation strategies for critical thinking in many different ways. This issue will be discussed more in the following section.

Figure 1. Practical Inquiry model (Garrison et al., 2001, p .99)

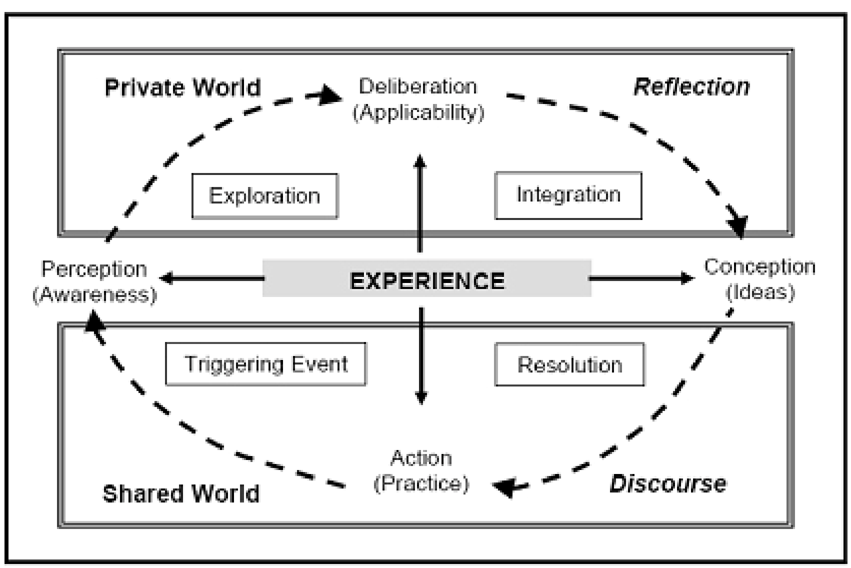

Figure 2. Elements of an educational experience in a Community of Inquiry (Garrison et al., 2000, p .88)

The Practical Inquiry model well represents the conceptual relations of critical thinking components in the inquiry process, including four phases (i.e., *a triggering event, exploration, integration, and resolution*). First of all, an issue or problem arises as *a triggering event,* the first phase of inquiry (see Table 1). After that, brain-storming and exchange of information occur in *exploration*. Based on the divergent phase of *exploration,* learners construct shared meaning in *integration*. In the last phase, *resolution,* learners apply the issue or problem that emerged in *the triggering event* (Archer et al., 2001; Garrison et al., 2001).

Table 1. *Four phases of critical thinking (Garrison et al., 2001)*

Events	Indicators	Processes	Examples
1. Triggering event: Evocative	1.1 Recognizing the problem	Presenting background information that culminates in a question.	It has been argued that the only way to deliver effective distance education is through a systems approach. However, this approach is rarely used. Why do you think that is?
	1.2 Sense of puzzlement	Asking questions Messages that take discussion in a new direction	
2. Exploration: Tentative	2.1 Divergence: within the online community	Unsubstantiated contradiction of previous ideas	One reason I think it is seldom used is that it is too complicated to gain cooperation. Another may be the mind-sets of those in charge of changing practices.
	2.2 Divergence: within a single message	Many different ideas/themes presented in one message	
	2.3 Information exchange	Personal narratives/descriptions/ facts (not used as evidence to support a conclusion)	
	2.4 Suggestions for consideration	Author explicitly characterizes message as explorations (e.g., “Does that seem about right?”, “Am I way off the mark?”)	

	2.5 Brainstorming	Adds to established points but does not systematically defend/justify/ develop addition	
	2.6 Leaps to conclusions	Offers unsupported opinions	
3. Integration: Provisional	3.1 Convergence among group members	Reference to previous message followed by substantiated agreement (e.g., "I agree because…") Building on, adding to others' ideas	We also had trouble getting cooperation. Often the use of new tools requires new organizational structures. We addressed these issues when we implemented a systems approach, and I think that's why we were successful.
	3.2 Convergence within a single message	Justified, developed, defensible, yet tentative hypotheses.	
	3.3 Connecting ideas, synthesis	Integrating information from various sources—text book, articles, personal experience	
	3.4 Creating solutions	Explicit characterization of message as a solution by participant	
4. Resolution: Committed	4.1 Vicarious application to real world	Non coded	How we solved this problem was…?
	4.2 Defending solutions	Non coded	

As mentioned above, because of the original purpose, this practical inquiry model can be used not only for understanding the phases of the critical thinking process but also for analyzing the quality of critical thinking in online discourse. Generally in the analysis of critical thinking, *integration* and *resolution* are considered as vital aspects related to high quality critical thinking, rather than *a triggering event* and *exploration* (Garrison et al., 2000). This is because *integration* and *resolution* deal with synthesizing and application. Therefore, in order to design effective facilitation strategies to foster critical thinking, colleges should pay more attention to the *integration* and *resolution* phases.

Online Facilitation Strategies to Promote Critical Thinking

Learners' critical thinking skills can be supported and enhanced through the guidance of facilitators in online collaborative learning situations such as instructional activities to scaffold student thinking process (Ahern, Peck, & Laycock, 1992; Brookfield, 1987; Garrison et al., 2005; Jonassen, 1996; Salmon, 2000; Sharma & Hannafin, 2004; Zhu, 1998). Therefore, in this section, four online mentoring guidelines designed by Collison, Elbaum, Haavind, and Tinker (2000), Duffy et al. (1998), Angeli et al. (2003), and Anderson et al. (2001), will be described and compared in terms of general online facilitation strategies and specific examples. This review will be helpful to provide better understanding about online discourse facilitations and to create effective facilitation strategies based on the context of each institution.

These four online facilitation guidelines have been selected because their goals, values, and components are clearly identified (Reigeluth, 1999), and their importance and applications can be considerable in the wide range of online learning. All of the four online discourse facilitation guidelines are based on asynchronous message transmission and text-based communication conferencing systems.

Collison and His Colleagues' Critical Thinking Facilitation Strategies in Online Learning

Collison, Elbaum, Haavind, and Tinker (2000) considered critical thinking as an individual learner's internal process, and they proposed detailed facilitation strategies to mediate information and promote learners' critical thinking in online learning environments (see Table 2). Basically, their facilitation strategies suggest that learners' critical thinking should be integrated through two main instructional strategies: (a) *sharpening the focus* and (b) *deepening the dialogue*. By *sharpening the focus,* facilitators can clarify the ideas and bring a common understanding among learners. This facilitating strategy highlights relevant ideas and key contributions, brings coherence, and pushes the dialogue forward. In the strategy of *deepening the dialogue,* facilitators can extend learners' thoughts by articulating more in-depth discussions on the common ground. Also in the *deepening the dialogue* strategy, facilitators can build on common ground where participants examine their own beliefs and assumptions, reflecting on perturbations to build new levels of understanding (Collison et al., 2000).

Table 2. *Critical thinking facilitation strategies, adopted and modified from Collison et al. (2000)*

General strategies		Specific Strategies
Sharpening the focus	Identifying direction	• Selectively highlight or paraphrase relevant discussion. items in order to refocus or redirect conversation, possibly weaving several discussion threads or ideas to provide a new focus.
	Sorting ideas for relevance	• Ask students to classify or form comparisons. • Alternatively, if needed, call attention to sorting of ideas, making public the sorting mechanism, to focus on relevance and importance. • Highlight "hidden gems" in postings to bring them out of obscurity.
	Focusing on key points	• Ask them to summarize or synthesize. • If necessary, eventually highlight key contributions, essential concepts, and connections so far. • Bring to light potential gaps or tensions. • Provide big picture, but do not summarize in detail or infer future direction—push participants to draw these inferences and assessments by themselves. • Ask them to evaluate the strength of their ideas, seek judgments and assessments, and eventually reach consensus.
Deepening the dialogue	Full-spectrum questioning	• Use a wide questioning approach (e.g., who, what, when, where, why) to push participants to examine their own personal, or collective, thoughts and beliefs. • Push them to go beyond by asking "so what?" in a specific context • Ask them to consider other perspectives that they may not have thought about before. • Ask them to clarify or elaborate their ideas. • Ask them explore their assumptions and sources and provide a rationale or examples for their ideas. • Ask questions to identify cause and effects/outcomes. • Ask the team to solve discrepancies in the ideas. • Ask questions considering appropriate action or inquiry especially if the discussion is stuck.
	Making connections	• Stretch the participant's imagination or conceptual frames to consider obscure but essential similarities. • Move beyond the barriers of previously held beliefs or assumptions that may block these connections across contexts or at deeper levels.
	Honoring multiple perspectives	• Lay out the landscape of different views present in the discussion. • This is usually the last stage before the group completes their final task.

Duffy and His Colleagues' Critical Thinking Facilitation in Electronic Conferencing Systems

On the other hand, Duffy, Dueber, and Hawley (1998), who assumed that critical thinking is collaborative inquiry, argued that high critical thinking involves building a strong argument with its essential elements (i.e., *hypotheses, counter-arguments,* and *evidence*). For this reason, facilitators should support increasing (a) *the quality of an individual learner's analysis of the problem*, (b) *the quality of the counter-arguments*, and (c) *the quality of the evidence in the inquiry process.*

Table 3. Critical thinking facilitation, adopted and modified from Duffy et al. (1998)

General strategies		Specific examples
Improving the quality of the analysis	Analyzing problems	• What seems to be standing out in all of this?
	Identifying evidence	• Do I know of evidence to support or refute that idea? • What evidence should I seek?
	Comparing alternative hypotheses	• Can we approach this problem another way?
	Summarizing discussion	• Can I organize what we have done so far? • What do we know so far?
	Considering implications of proposed solutions	• What do we have to do next? • How does that relate to the problem/solution?
Encouraging activities in conversation	Monitoring understanding	• Do I understand the terms that were used?
	Asking questions	• How does that fit into the discussion?
Developing order and focus of discussion	Developing order of discussion	• Where are we in relation to developing a solution?
	Developing focus of discussion	• What are the key ideas and issues we have been talking about?

In addition, Duffy et al. indicated that there are two distinct types of interactions in the collaborative inquiry, *issue-based discussion* and *conversation*, and emphasized that not only *issue-based discussion* (i.e., *critical reasoning discussion*) but also *conversation* (i.e., *general group discussion*) must be supported to foster critical thinking in the conferencing systems.

Angeli and Her Colleagues' Electronic Mentoring in a Web-Based Conferencing System

As another set of cognitive facilitation strategies to increase the quality of electronic conferencing on the web, Angeli, Valanides, and Bonk (2003) suggested twelve online mentoring forms according to (a) *high-level mentoring*, (b) *low-level mentoring*, and (c) *management*, modified from Bonk and King (1998)'s mentoring model (see Table 3). In the *high-level mentoring* strategies, cognitive task structuring, pushing to explore, cognitive elaboration/explanations, fostering reflection/self-awareness, and encouraging articulation were applied. Instead of providing ready answers to students, the facilitators guided them to reflect their thinking more deeply from others' perspectives. For *low-level mentoring*, six strategies were considered: social (and cognitive) acknowledgement, general advice/scaffolding/suggestion, feedback, direct instruction, questioning, and modeling/examples. For *management*, mentoring through private e-mail or discussion was proposed.

Table 4. Electronic mentoring, adopted from Angeli, Valanides, & Bonk (2003, p. 34)

General strategies		Specific examples
High level mentoring	Cognitive task structuring	• You know, the task asks you to… • Ok, now summarize the peer responses you have received. • How might your textbook authors have solved this case?
	Push to explore	• You might want to write to Dr XYZ for… • You might want to do an ERIC search on this topic…

		• Perhaps there is a Web site that addresses this topic…
	Cognitive elaboration /explanations	• Provide more information here that explains your rationale. • Please clarify what you mean by… • I'm just not sure what you mean by… • Please evaluate this solution a little more carefully.
	Foster reflection/ self-awareness	• Restate again what the teacher did… • How have you seen this before? • When you took over this class, what was the first thing you did? • Describe how your teaching philosophy will vary from this… • How might an expert teacher handle this situation?
	Encourage articulation	• What was the problem-solving process the teacher faced here? • Does anyone have a counterpoint or alternative to this situation? • Can someone give me three good reasons why…. • It still seems like something is missing here. I just can't put my finger on it.
Low level mentoring	Social (and cognitive) acknowledgment	• Hello…. • I agree with everything said so far…. • Wow, what a case. • This case certainly has provoked a lot of discussion… • Glad you could join us.
	General advice/ scaffolding/ suggestion	• If I were in her shoes, I would… • Perhaps I would think twice about… • I know that I would first… • How totally ridiculous this all is: certainly the teacher should be able to provide some…
	Feedback	• That shows real insight into… • Are you sure you have considered…
	Direct instruction	• I think in class we mentioned that… • Chapter X talks about… • Remember back to be first week of the semester, when we went over X, which indicated that…
	Questioning	• What is the name of the concept? • Another reason for this might be… • What else might be important here? • Who can tell me…? • How might the teacher…? • What is the real problem here?
	Modeling/examples	• I think that I solved this sort of problem once when I… • Remember that video we saw on X, wherein Y decided to… • Doesn't X give insight into this problem in case Z, when he/she said…
Management	Through private e-mail or discussion	• Don't just criticize… please be sincere when you respond to your peers. • If you had put your case in on time, you would have gotten more feedback. • If you do this again, we will have to take away your privileges.

Anderson and His Colleagues' Teaching Presence in a Computer Conferencing Context

Based on Garrison et al. (2000)'s critical thinking and practical inquiry model, Anderson and his colleagues (2001) developed a tool to assess *teaching presence* in online computer conferencing, which can be used as a guideline for facilitating computer conferencing (see Table 5). Depending on the role of facilitating discourse, the concept of teaching presence divides into three categories: (a) *direct instruction*, (b) *facilitating discourse,* and (c) *design and organization*. Nevertheless, these notions also imply the relationships of *cognitive, social,* and *teaching presences*, which are three key elements in the community of inquiry model as mentioned earlier (see Figure 1). *Direct instruction* among the teaching presence characteristics is relevant to *cognitive presence*, which refers to critical thinking inquiry. *Facilitation discourse* is more related to *social presence*[1] and *design and organization* is associated with *management* issues. Despite these conceptual distinctions, all three *teaching presence* characteristics contain overlapped and shared parts within the community of inquiry model due to the nature of the discourse.

Table 5. Teaching presence facilitation strategies, adopted from Anderson et al. (2001)

General strategies		Specific examples
Direct instruction	Presenting content/questions	• Bates says…what do you think?
	Focusing the discussion on specific issues	• I think that's a dead end. I would ask you to consider…
	Summarizing the discussion	• The original question was …Joe said…Mary said…we concluded that…We still haven't addressed…
	Confirming understanding through assessment and explanatory feedback.	• You're close, but you didn't account for… This is important because…
	Diagnosing misconceptions	• Remember, Bates is speaking from an administrative perspective, so be careful when you say…
	Injecting knowledge from diverse sources (e.g., textbook, articles, internet, personal experiences; pointers to resources)	• I was at a conference with Bates once, and he said… • You can find the proceedings from the conference at http://www….
	Responding to technical concerns	• If you want to include a hyperlink…
Facilitating discourse	Identifying areas of agreement/disagreement	• Joe, Mary has provided a compelling counter-example to your hypothesis. Would you care to respond?
	Seeking to reach consensus/understanding	• I think Joe and Mary are saying essentially the same thing.
	Encouraging, acknowledging, or reinforcing student contributions	• Thank you for your insightful comments.
	Setting climate for learning	• Don't feel self-conscious about "thinking out loud" on the forum. This is a place to try out ideas after all.
	Drawing in participants, prompting discussion	• Any thoughts on this issue? • Anyone care to comment?
	Assess the efficacy of the process	• I think we're getting a little off track here.
Design and organization	Setting curriculum	• This week we will be discussing…
	Designing methods	• I am going to divide you into groups, and you will debate…
	Establishing time	• Please post a message by Friday. . .

[1] The authors identified that *facilitation discourse* is not completely related to the pure social aspect (e.g., chatting, coffee room), unlike the notion of "social" in the previous researches of their study.

	parameters	
	Utilizing medium effectively	• Try to address issues that others have raised when you post.
	Establishing netiquette	• Keep your messages short.

Comparisons of Four Online Facilitation Guidelines for Critical Thinking

So far, each of the four online facilitation guidelines for critical thinking has been reviewed regarding the general strategies and specific examples (Collision et al., 2000; Duffy et al., 1998; Angeli et al., 2003; Anderson et al., 2001). However, in order to create ideal facilitation strategies for promoting critical thinking, it is necessary to compare four online facilitation guidelines in a single conceptual framework. This comparison will allow researchers to discover the strengths and weaknesses of each facilitation guideline. As the conceptual framework for this comparison, Angeli et al.'s mentoring levels (2003) and Garrison et al.'s critical thinking phases (2000) were adopted. Only main categories of the general facilitation strategies in the four online facilitation guidelines were reorganized to compare the similarities and differences (see Table 6).

Table 6. Online facilitation strategies for critical thinking, adopted and modified from Anderson et al. (2001), Angeli et al. (2003), Collison et al. (2000), and Duffy et al. (1998)

Critical thinking		Collison et al. (2000)	Duffy et al. (1998)	Angeli et al. (2003)	Anderson et al. (2001)
Level	Phase				
High level critical thinking facilitation	Triggering event	Identifying direction	Analyzing problems	Cognitive task structuring	Presenting content/questions
	Exploration	Full-spectrum questioning	Asking questions	Push to explore	Diagnosing misconceptions
			Monitoring understanding		Confirming understanding through assessment and explanatory feedback.
			Summarizing discussion		Summarizing the discussion
			Identifying evidence	Cognitive elaboration/ explanations	Injecting knowledge from diverse sources
		Sorting ideas for relevance	Developing order of discussion		
		Focusing on key points	Developing focus of discussion		Focusing the discussion on specific issues
	Integration	Making connections	Considering implications of proposed solutions	Encouraging articulation and fostering reflection/self-awareness	

		Honoring multiple perspectives	Comparing alternative hypotheses		Identifying areas of agreement/ disagreement Seeking to reach consensus/underst anding
	Resolution				
Low level critical thinking facilitation				General advice/scaffolding/ suggestion Direct instruction Modeling/ examples Questioning Feedback	
				Social (and cognitive) acknowledgment	Encouraging, acknowledging, or reinforcing student contributions
					Setting climate for learning Drawing in participants, prompting discussion
Non-critical thinking facilitation				Through private e-mail or discussion	Setting curriculum Designing methods Establishing time parameters Utilizing medium effectively Establishing netiquette Assessing the efficacy of the process Responding to technical concerns

Based on the comparison of online instructional strategies for critical thinking, there are four major findings. First of all, in terms of conceptual scopes and boundaries, two facilitation guidelines did not consider certain aspects of critical thinking, such as social and organizational aspects. Due to the nature of CMC as shown in the community of inquiry model (see Figure 2), all three dimensions in online discourse (i.e. *cognitive, social,* and *teaching presences*) somewhat overlap and influence each other. For this reason, several researchers, such as Paulsen (1995) and Mason (1991), divided the online educational moderators' role into three major responsibilities: intellectual, social, and organizational. However, Collision et al. and Duffy et al.'s facilitation strategies excluded social and organizational aspects, which are relatively less related to the notion of critical thinking. Meanwhile, Angeli et al. and Anderson et al. involved some of these aspects, such as *low-level mentoring*, *social presence* (i.e., *setting climate* in Figure 2), and pure *teaching presence* (i.e., *structure/process* in Figure 2). Collison et al. and Duffy et al. might want to present only key strategies directly related to promoting critical thinking. However, it would be necessary to consider the dynamic relationships of *cognitive* and *social presences* in online discourse to foster critical thinking (e.g., *social* and *cognitive* acknowledgement for encouraging discussion activities of Angeli et al.).

Second, in terms of the components and ratios, there are similar patterns between the reorganized facilitation strategies in this paper and the content analysis results of critical thinking in Garrison et al. (2001)'s study. Overall, reorganized facilitation strategies (see Table 6) cover three phases (i.e., *a triggering event, exploration,* and *integration*) among four critical thinking phases. Also, interestingly, the ratios of these reorganized facilitation strategies in terms of critical thinking phases are similar to those of the results in Garrison et al.'s content analysis of an online discussion (2001). For example, *exploration* (42%), *integration* (13%), *a triggering event* (8%), and *resolution* (4%), excluding *others* related to *social presence* (33%), were shown in their analysis results. Meanwhile, *exploration* (16), *integration* (8), and *a triggering event* (4) were in the order of the total numbers of reorganized general facilitation strategies on Table 6. However, any single strategy of the four facilitation guideline sets will not fit into *resolution*. As shown in Garrison et al.'s analysis result, *resolution* may not be often observed in real online discourse. In fact, Garrison and his colleagues tried to explain this interesting result related to *resolution* considering three potential reasons associated with the goals, the medium, and the practical inquiry model. Despite the lack of frequency, *resolution* is still considered as the most important event among the four phases in terms of judging the quality of critical thinking in discourse as well as completing the critical inquiry process.

Third, based on the assumption of critical thinking related to inquiry, several similarities and differences are shown in terms of the focus of facilitation strategies. For example, Duffy et al. and Anderson et al., whose facilitations were based on a strong notion of collaborative inquiry, presented relatively more detailed strategies in *exploration.* Meanwhile, Angeli et al. proposed several direct instructional guidelines (e.g., *direct instruction, modeling/examples, feedback*) as *low-level mentoring*. On the other hand, interesting differences between Duffy et al. and Anderson et al.'s strategies were shown. Both of them emphasized the importance of encouraging group discussion (i.e. *encouraging activities in conversation* in Duffy et al. and *facilitating discourse* in Anderson et al.; see Tables 3 and 5). However, the general facilitation strategies selected to promote group discussion in one study contrasted with the other. Duffy et al. focused on cognitive reasoning (e.g., *asking questions, monitoring understanding*), while Anderson et al. added *social presence* strategies (e.g., *encouraging, acknowledging contributions, setting climate for learning*).

Last, several facilitation strategies were under inappropriate categories in their original guidance. For instance, *responding to technical concerns* was initially placed in the *cognitive presence* category called *direct instruction* (see Table 5). However, because the focus of *responding to technical concerns* is not related to the cognitive aspect in discourse, it should be under the *non-critical thinking facilitation* category as shown on Table 6. In this way, *identifying areas of agreement and disagreement* and *seeking to reach consensus/understanding,* which originally belonged to the *social presence* category called *facilitating discourse* (see Table 5), were moved to the *integration* of *high level critical thinking facilitation*.

How to Promote Critical Thinking: Conclusion and Caveats

Critical thinking becomes a prime goal of postsecondary education targeted for future mid-career knowledge workers, concurring with the needs in the work place. Now the importance of critical thinking has been emphasized in higher education more than ever. Therefore, as the vital aspects of critical thinking, four events of cognitive presence (i.e., *a triggering event, exploration, integration*, *resolution)* from Garrison et al.'s community of inquiry (2000) were reviewed in this study. The online facilitation guidelines of Collison et al. (2000), Duffy et al. (1998), Angeli et al. (2003), and Anderson et al. (2001) were described and reorganized to compare their similarities and differences at the levels and phases of critical thinking.

However, in the comparison of these facilitation guidelines, several critical points are founded that cannot be easily dismissed. To overcome these weak points, the following three suggestions can be considered.

First, in terms of the conceptual scopes and boundaries of critical thinking, the relationships between *social presence* and *cognitive presence* should be more carefully considered in facilitation guidelines. This is because critical thinking includes both emotive and rational aspects at the same time (Brookfield, 1987; Garrison et al., 2000). For instance, in a case of *encouraging participation in discussion*, providing facilitation strategies emphasizing social aspects may be more effective.

Second, missing strategies in several subcomponents of the phases should be designed, regarding the relations between the facilitation strategies and critical thinking phases. For example, *resolution* and *integration* are crucial events in order to evaluate the quality of online discourse during the critical inquiry process (Garrison et al., 2000; Duffy et al., 1998). Nonetheless, Garrison et al. (2000) and Anderson et al. (2001)'s strategies did not provide specific facilitation guidance for the *resolution* event in *teaching* *presence*. In fact, some critical thinking steps are more personal reasoning processes, so facilitation is not much help for these critical thinking steps. However, the *resolution* event belongs to the area of *discourse* in *the shared world,* according to Garrison et al. (2000)'s practical inquiry model (see Figure 2). For this reason, it is obvious that facilitators' mentoring in the *resolution* event is more essential to the learners' inquiry processes.

Last, facilitator's intervention in discourse should be further investigated to figure out ideal intervention levels. Due to the nature of the inquiry process as well as the personal style of the facilitator, to control intervention degrees in online mentoring is not easy, especially for novice facilitators. Thus, considering various inquiry situations and facilitators' personal values, more detail facilitation guidelines should be designed (Reigeluth, 1999).

The four facilitation guidelines discussed in this paper can not be the best for all colleges, even if they are modified according to the above suggestions, because the contexts of institutions are different. Thus, each college should develop proper facilitation strategies for their own institutions and students to achieve the ultimate goal of critical thinking. In the same way, the methods of mentoring facilitators should be designed, considering unique situations of organizations and faculties. Furthermore, the colleges should examine the effects of their own facilitation strategies and mentoring programs through design-based research approaches and continuously modify them based on the findings (Barab, Kling, & Gray, 2004; Reigeluth & Frick, 1999; Richey, Klein, & Nelson, 2004; Winn 2002).

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Learning to Think like Instructional Designers in a Kaleidoscope of Cultures: Using Reflective Practices in Thailand, India, and the US

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Abstract

Engaging novices in reflective activities can enhance instructional design (ID) practices (Bellefeuille, 2006; Orland-Barak & Yinon, 2007). As part of a community of practitioners it is expected that instructional designers will engage with the resources and people of the community, develop ID competencies, and help enhance community practices. Reflective practices like engaging in relaxation activities prior to contemplation, drawing and writing, and peer critique activities can foster learning and the transfer of ideas into improved practices (Cyboran, 2005). Reflective practices can support newcomers in thinking about their role and the work of the community, developing new perspectives on ID, and sharing the meaning of their work with other members in a continual process of transforming ID practices. This paper describes theories, techniques, guidelines, and examples of reflective practices in action with ID newcomers.

Introduction

Becoming a member of a practice community often begins with some vague ideas of the members' work (Lave & Wenger, 1998). A mental model is conceived that explains the community members' identities, e.g., their goals, how they frame problems, what rules they use for engaging in the community's work, and which tools and resources they choose to support problem solving (Engestrom, 1999; Kuttii, 1991; Schön, 1987). These ideas develop over time through learning, observation, conversation, inquiry into the practices of the community, and reflection. As individuals begin to make choices to join and engage in a community, other experiences (e.g., peripheral engagement) enlighten their journey toward, and understanding of, their role in the community's practices. Engaging in guided and individual reflection can help newcomers learn about the work, rules, tools, methods, practices, and relationships within the community and their own roles and responsibilities as practitioners. This reflection both informs knowledge and competency development and encourages community building in one's own context (Barry, 1994; Bellefeuille, 2006; Lave & Wenger, 1998; Orland-Barak & Yinon, 2007). Continued reflective practices coupled with dialogue among newcomers and old timers can bring newcomers from peripheral participation into a richer and fuller understanding of, and participation in, the work of the community. Ultimately this leads to the transformation and improvement of the community's overall practices and the individual's recognition of meaning in his or her work (Korthagen, 1990; Lave & Wenger, 1991).

Theory Behind Community Building through Reflective Practices

In this context, a community of practice is defined as a culture or a group of individuals who engage in a common tradition of work, e.g., educators, instructional designers (Levinson & Holland, 1996). The members of the community transmit their knowledge to newcomers through a process of creating and sharing meaningfulness and engaging them in peripheral practices and with resources (e.g., people, tools, methods, theories, rationale, etc), eventually leading into full participation in the work of the community (Lave & Wenger, 1991). The members engage in activities to maintain, change, and expand practices based on new ideas and knowledge brought into the community. Thus, some communities remain stable and interact mainly within their own community. Others evolve beyond their practice contexts to engage, share, and interact as interdisciplinary communities (McArdle & Ackland, 2007). For example instructional design community members engage far beyond formal education contexts in K12, higher education, and continuing education, into areas such organizational design, human performance, and technology design and development in multiple content domains. The combination of learning, reflective practices, and sharing of ideas is at the root of the enculturation process within a community and how it dynamically transforms itself based on member responsiveness to the world (Deglau et al., 2006; Levinson & Holland, 1996).

A starting point in understanding these community level changes is to consider the assumption that an individual's behavior is directed by cognition. Individuals create mental structures (schema) as models of reality which helps them to interact with the environment and to anticipate future behaviors and actions (Korthagen, 1990). Prior knowledge is a key component in the learning process in which these schema are created (Bransford, 1979). Schema can be modified through a gradual accumulation of information (accretion), evolutionary changes in the way information in an existing schema is interpreted thus changes a schema (tuning), or through completely restructuring new information to create a new schema (Rumelhart & Norman, 1981; Vosniadou & Brewer, 1987). Reflection plays a significant role in helping the individual identify inconsistencies, gaps, or problems with his or her models and determine ways to close or reframe his or her thinking, and ultimately his or her practices (Schön, 1987). Individual and guided reflection techniques can promote the process of restructuring an individual's frames of reference, thus affecting the individual's mental models and representations of his or her experiences (De Jong & Korthagen, 1989 as cited from Korthagen, 1990). Further, sharing these models within a community of practice supports the learning (enculturation) process and provides the vehicles with which to enhance practice.

One of Dewey's (1933) basic assumptions was that learning improves to the degree that it arises out of the process of reflection. Reflection arises because the *organism* detects the appearance of *incompatible factors* within a *situation* then develops opposed responses in an attempt to further engage in and understand the situation thereby constructing knowledge (schema). Knowing therefore is not a process of registration or representation, but one of active intervention. Knowledge is constructed, in part, through reflection, e.g., ongoing active, persistent, and thoughtful consideration and participation in a situation (Canning, 1991). The cycle of reflecting and learning is thus determined by the changes one finds satisfactory about a new situation on the whole or by the discovery of new features that give the situation new meaning. Reflection is important in that it encourages humans (organisms) to explore and implement new practices or ways of thinking (incompatible factors) into their context (situation) to reduce the perception of incompatibility. Such reflections may prompt individuals to face environmental constraints, incrementally develop new practices that lead to successful practices, and specify for themselves the relationships between theoretical benefits of new ways of thinking and successful practice (Collis, 1996; Ertmer, 2003).

Another definition of learning implies becoming a different person with respect to the possibilities enabled by the system of relationships within a community of practice (Lave & Wenger, 1998). Newcomers are enculturated into a community through these processes of learning, thinking, and meaning making while they are situated within and engaging with the resources of the community. Newcomers inevitably participate in communities of practitioners by engaging in and with community activities, identities, artifacts, and practices (Bruner, 1996). Newcomers must be supported however as they transition from peripheral participation to full engagement. This support often comes in the form of apprenticeship-type activities accompanied by reflective practices (Lave & Wenger, 1998; Seely Brown, Collins, & Duguid P, 1996). As newcomers transition in the extent of their participation, their entire being (intellect, affect, behavior) is transformed through their own labor and reflections as they develop the knowledge and skills of their trade. More importantly they deepen self-understanding of their work and form meaningful and authentic relationships with those whom they interact in their everyday lives (Lave & Wenger, 1998; Seely Brown, Collins, & Duguid P, 1996; Seely Brown & Duguid, 1996).

Thus, becoming a practitioner in the instructional sciences suggests becoming enculturated into the community of instructional designer practitioners. Through a series of educational and experiential activities, engagements with experienced members within the community, and reflective practices newcomers can begin to create more complete and accurate mental models of the community and find their place within it. Newcomers can also develop deep understanding of their profession and develop meaningful relationship with colleagues that can lead to transformations of practices within the community. Reflective practices help in this process, however are not as simple as looking at a situation and brainstorming solutions. Reflection is a continual process of deepening understanding through careful consideration of the internal and external factors that guide action.

Reflective Practices Techniques and Guidelines

Several different reflection techniques, both individual and guided reflections, have been found to support practice development (Armstrong 2007; Barry, 1994; Cyboran, 2005; Orland-Barak & Yinon, 2007; Pavlovich,, 2007; Wagner, 2006). These include prompted *guided reflection*, *peer sharing of personal reflections and critiques* of work activities and products, and *individual reflective writing and drawing* activities. These techniques are used in both group learning and individual contexts, often being most transformative to a community when coupled with discourse among novice, mid-level, and expert community members.

Relaxation techniques are often coupled with reflective practice to help open the individuals mind to the many different possibilities beyond shallow environmental factors that impact practice by helping the individual to reflect honestly and holistically, reaching deep and meaningful levels of thought rather than simply being reactionary and focused on surface level thoughts. It is the deep understanding about our work as practitioners that when shared can impact and enhance the community practices as a whole. Reaching that deep level, or contemplative level, of reflection requires commitment and good technique.

Reflection Traditions and Techniques

There are several traditions or theoretical perspectives on reflective practice and accompanying techniques. Some are based in psychological practices and other in spiritual. Common among both is that the individual must learn how to engage in ways that activate previous knowledge, deep and authentic self recognition, and thinking. As a note, practicing and facilitating reflective practices that truly engage the individual and groups in thoughtful reflection can take many years of practice. Those who teach or guide reflective techniques generally participate in intense training in the techniques and practices, learn how to achieve deep reflective practices themselves, and learn how to help others in such techniques. The simplicity of guidelines and implementation examples presented here were ministered in practice by highly trained facilitators. A short list of additional resources, from psychology and faith-based traditions, on how to prepare to practice and facilitate such sessions are listed in the appendix. The following technique descriptions are modified excerpts from *Healer's Art Instructors' Handbook Upstate Medical University* composed by Dr. Lynn-Beth Satterly, MD *(Satterly, 2005).*

Preparing to Facilitate Reflective Sessions

The facilitator's technique and enthusiasm for and comfort with this activity is key to its success. In order to authentically lead a group through a guided relaxation and reflection, the facilitator should have at least some practice and experience with relaxation and reflection techniques. If the facilitator is not an experienced mediator, he or she may wish to practice this exercise alone before leading a group. The facilitator should lead this exercise with a calm demeanor and a clear but smooth, soothing tone of voice. It is helpful if you can do a personal meditation/relaxation exercise just before you lead the group. Experienced mediators can often bring themselves into the appropriate reflective state when they need to, without formally going through the relaxation/meditation exercise.

Do not confuse "soft" voice with soothing voice. Speak loudly enough so that all can hear you without straining but do not raise your voice or yell. Keep in mind that you should lead the group through these types of exercises slowly. Going too quickly is more problematic for the effectiveness of the activity than going too slowly. As you become more experienced, you may be able to "feel" the energy and the group and recognize whether or not they need to spend more or less time on a particular part of the guided relaxation.

A guided relaxation can be done effectively with absolutely no tools other than the facilitator's voice and facility with the particular relaxation/meditation script. Sometimes such simplicity is indicated and appropriate. However, sometimes certain supplements can be used to create ambiance and foster relaxation and reflection. Items such as candles and music can be helpful. With experience and knowledge of a particular group, setting and topic, the facilitator will develop a sense of when the simple or more enriched environment is appropriate. It makes the activity flow more smoothly if the group is given the crayons and paper for the drawing and writing activities or asked to have journaling supplies available before the guided relaxation is begun. These supplies, however, should not be in a place that interferes with the participants' ability to open their hands and settle into comfortable positions.

The relaxation/centering facilitator may wish to play soft background music, dim the lights and light candles. Desks and seats arranged in a semi-circle or a circle can be effective. Participants sometimes like to sit on the floor and can be invited to do so if the room allows or if participants have a mat, pillow or rug to sit on. If the environment has a lot of background noise, during the guided relaxation the facilitator can invite the participants to acknowledge the background noise and imagine it drifting out of their consciousness. Although probably not ideal, even lecture hall seats can "work" for seating during a guided relaxation.

Guidelines for Relaxation and Reflective Sessions

There are many ways to conduct reflection sessions with groups. The following guidelines were designed to engage students in reflecting on topics covered during a larger seed talk or lecture session.

The general script for a beginning relaxation session

- I invite you to close your eyes or you may wish to focus on a focal point in the room. Settle into your chair or sit or lie in a comfortable position. Place your hands, palms up, either on your thighs, if you are seated, or by your side if you are lying down. If you are seated, you may wish to put both feet on the floor. Feel the chair against you back or feel your legs against the floor. Rest for a moment in awareness of these sensations. (Pause and let the group "remain" in this "place" for about 15-30 seconds.)
- Next, I invite you to focus on your breathing. Take several slow, deep breaths….in and out, in and out. Imagine breathing in all that fills you with life and good energy. As you breathe in and out, imagine breathing out all that causes distress, stress or dis-ease. (Pause and let the group experience this for about 15-30 seconds.) The body is endowed with the breath, a natural calming and focal point. If you find yourself becoming distracted or unfocused, you can always return to your breathing.
- Now, I'd like you to focus on your head and neck. Notice any discomfort, pain or tension. Imagine that discomfort, pain or tension as a current running from your head and neck, down your torso, down your legs, into you feet and out of your body and into the floor. Next, focus on your arms and torso, including your pelvis and the entire length of your back. Notice any discomfort, pain or tension. Imagine that discomfort, pain or tension as a current running from your arms and torso, down to your legs, into your feet and out of your body and into the floor. Repeat this process with your hips, legs and your feet. (Allow about 30 seconds each for the head and neck, arms and torso, and hips, legs and feet.)
- Return, if you will, to your breath. Take in a few slow, deep breaths, breathing in all that fosters your health and wholeness. Feel the rush of air in your nose and feel your lungs expose with this life-giving substance. Exhale, slowly and fully. Feel the air rush out of your nostrils and feel your chest relax. Breathe out all that causes you distress or dis-ease.
- (Allow 15 seconds so that the group can experience this.)
- Now I invite you to imagine a place where you feel totally safe and grounded. Image everything about this place. Try to smell how it smells, try to feel the temperature of the air in this place, envision how this place looks and try to hear in your mind any of the background sounds of this special place. Any or all of these are your places of ground. Rest there for a few minutes now. Know that you can always bring your mind back to this ground when you need to. (Allow 30 seconds so that the group can experience this)
- Now, in this place of the heart, where many believe intuitive knowledge resides, reflect upon… (The facilitator can whatever topic is relevant for the session such as wholeness and balance.)
- When you are ready, take your crayons and drawing paper (or journal and pen). (The facilitator describes the chosen activity.)
- When you are ready, return your consciousness to the room and open your eyes. Take a few minutes to settle into the present moment and into a state of daytime alertness.

The general format of the small group reflection session is as follows:

Pre-work activity (optional)

- Ask students to bring a drawing or reflective text they were prompted to create during other related reflections with them
- Ask students to bring objects with them which symbolizes an aspect of their wholeness, personal or professional identity.

Create ambiance

- Create focal point with placemat and candles or a table in the front or center of the room

Ice breaking

- Introductory exercise - Each person is invited to say their name and year of training and one thing that they'd like the group to know about themselves that people may not already know. At this time you can invite the students to talk about the object they brought and place it at a central location of the room.

Time of grounding: (3-5 minutes)

- Facilitator invites the students to come to quiet for a few moments and to consider again the topic of the evening

- Guided relaxation - Invite members to focus on their breathing or perhaps a candle or music or the background noise in the room until their mind is quiet and suggest that when their mind is quiet, they then focus on this moment and the meaning of their drawing. Invite them to rest there for a few minutes, closing their eyes if they wish. After a few minutes (don't rush this, people usually enjoy it and need it), invite them to return their conscious awareness to the room.

Small group dialogue

- Discuss topic of the evening from a personal experience perspective.
- Discuss and describe the activity from large group
- Dialogue- Invite them to hold up their drawings and talk about them. Remind them that there are no right or wrong answers and that they should try to speak from their hearts as much as from their heads.
- Wrap Up- About ten minutes before closing, invite anyone who has not yet spoken to speak if they wish, gently stating that it is close to the time to end the session. Invite others to speak if they wish.

Closing Circle activity

- Closing Circle Exercise- Introduce this activity. Each person will say their name at the sound of the tone or bell (You can think of whatever signal works for you; you can even softly say a word such as "peace" to signal that the next person should say their name.) and everyone in the room will sent unconditional positive regard silently to them. After thirty seconds, sound the signal again and the next person says their name….

General format for conducting reflective drawing is as follows:

Create ambiance

- Create focal point with placemat and candles or a table in the front or center of the room
- Before the students are taken into a guided relaxation technique, be sure that they each have a piece of drawing paper and several crayons, markers, or color pencils.

Begin Guided Relaxation (as mentioned above):

- Facilitator invites students to come to quiet for a few moments and to consider again the focus topic
- Guided relaxation - Invite members to focus on their breathing or perhaps a candle or music or the background noise in the room until their mind is quiet and suggest that when their mind is quiet, they then focus on this moment and the meaning of their drawing. Invite them to rest there for a few minutes, closing their eyes if they wish. After a few minutes (don't rush this, people usually enjoy it and need it), invite them to return their conscious awareness to the room.
- During the last part of the guided relaxation, before the students are invited to leave their state of relaxation, introduce the following activity.

Introduce drawing activity:

- Ask the students to think about the topic related to their professional and personal identities and the practices discussed in class. In this reflection they should consider an aspect of their wholeness, something that they like about themselves, something that is part of their authentic selves that is related to their practices. It may be something that they have not cultivated since beginning graduate school. It may be something that they need to nurture and acknowledge. Ask them to draw a representation.
- Suggest that although the students may have some words that they'd like to associate with their drawing they should focus on illustrations without words at this time. After a few minutes invite them to add words to their drawings if they find them useful and clarifying.
- Note: if this is an activity occurring over time ask students to reflect on previous drawings and make changes or entirely new illustrations representing their reflections at this time.

Conclude drawing activity:

- Ask students to write a short narrative about how they feel about their drawing and what it represents to them in the context of their own person practices and those of the community in which they are preparing to practice. (and how it may have changed over time)
- Offer an opportunity for students to share their thoughts and ideas about changes in their drawings
- Finish this exercise by finishing the guided relaxation. (small group dialogue, closing circle)

Summary of Guidelines and techniques for Relaxation and Reflective Sessions

Many other derivations of these techniques are possible. For example during short reflective drawing or writing activities students may be asked to illustrate their reflections about the topic of focus as guided by questions about what inspired or motivated them, how does their new knowledge or appreciation of their peers or own thoughts help them to better understand their new profession and place within it, or what confuses them about their work. Often such techniques are used in short 5 minute writing activities after lecture or discussion sessions. All of these activities are meant to prompt deeper, thinking individually or as a group, about our places within a community and how we can practice and inform the work of the community. The following stories demonstrate how ID community members were engaged in reflective technique to help them move more deeply into our community of practice and transform their smaller groups into effect practitioners of the larger ID community.

Stories of Engaging Instructional Design Novices in Reflective Practices

Three stories are told of engaging novices in different types of reflective practices to help enhance their abilities to think like instructional designers. Each story begins with a statement of the problem (context) in which the designers were engaged in reflective practices. The stories of the context then illustrate the critical nature of our work as instructional designers and of the depth of knowledge and flexibility we must have to resolve these complex problems and practice well within our contexts. The reflective techniques practiced in response to the problem and stories are then described.

A Story from Work in Thailand …

The Problem. Lack of technology integration practices in classroom practices.

The Story. New technologies were acquired at a large school in Bangkok. The school has an excellent reputation, high quality educators, comprehensive and interdisciplinary curriculum, and technical resources and personnel support. Yet, there was minimal use of these new technologies in the classrooms. Further investigation suggested that there were pockets of effective technology integration, but most of the educators were lacking ideas of how to start using technology resources within their current pedagogical content knowledge schemes. The educators had technical proficiencies and some basic models guiding technology integration practices, yet were lacking experiences of how to fully infuse technology resources into their classroom practices. The school administer requested that a group of educators take a leadership role in designing, developing, and implementing best practices of technology integration and share these new practices with their colleagues to start wide adoption of technology integration practices. A workshop was created to help an educator leadership group develop a better conception of technology integration models, reflect on how to design learning experiences with embedded technology resources, and most importantly develop into an effective community of technology integration leaders who would drive dissemination and adoption activities. The goal was to begin to create a community of leaders who were knowledgeable about technology integration and who trust, share, critique, collaborate, and encouragement engagement among its members.

Reflective Techniques. A variety of reflective activities were used during the workshop sessions to help the group develop into a community of technology integration leaders. One such technique was a *community building reflection activity* that encouraged each educator to identify and share an object of their choosing that illustrated who they are and how they see themselves as a member of the school's teaching community and this new leadership community. At the end of one of the workshop session the educators were taken through a series of reflective activities on technology integration models covered during the day. This final reflection began by engaging the educators in a relaxation activity where they were ultimately asked to think about who they were within the communities at the school. In their thinking they were asked to visualize objects that illustrated their thoughts and feelings. They were asked to bring such an object to the next session and prepare to describe how it represents them and their view of their role as educators and leaders. A table was setup in the middle of the room for the next session and each educator presented his or her item and the story behind it. Some brought small gifts from students or their own


Figure 1. Educators share objectives that illustrate their reflection on *who they are* in this community of practice

education and shared deep thoughts about what brought them to education and their uncertainty about technology. Some shared items like grading books that represented broader perspectives of who they were in roles as teachers, and learners or report cards that also represented their roles as concerned parents. Others were very literal in that their items were technologies e.g., jump disk, cell phone, yet told stories of how the items represented their roles as communicators or keepers and sharers of information. Most also expressed in their stories the passion they have for being educators. Most seemed surprised at how and what their colleagues shared. See figure 1.

A Story from Work in India…

The Problem. Poor school conditions, new technologies emerging, few quality curricular materials available, movement to improve the education system for the most neglected and underserved populations of children.

The Story. In many parts of India the educational system for the poor is marginal at best. Over the last several years a major effort was undertaken to improve the government schools and increase student attendance and quality of education. New programs provide uniforms (clothing), food, trained teaching staff, and minimal teaching resources to the government schools that reach +250 million children (a ratio of 100:1 students to teachers) throughout India. Attendance has increased, however the quality of instructional materials and delivery of instruction are both still in question. Educational technologies, in the context of strong instructional design practices, are being investigated to help in the quest to improve the school system and create better opportunities for the poor to advance and become productive members in India's society. A national workshop was designed to engage a cohort of 100+ content creators (instructional designer) from educational and commercial organization across India in activities to help them think more like instructional designers, apply sound instructional design practices and learning sciences in the creation of quality school materials (e-learning resources) for India's government schools. Many newly develop e-learning products were showcased throughout the workshop. Upon critique many were found to cover basic content yet lack sound design decisions in their interface design and how they engage learners. Upon inquiry with the content creators (prior to and during the workshop) it was found that the they were often self-trained instructional designers, and although able to effectively discuss ID sciences, often they did not think beyond the capabilities of the technologies available and the existing curricular materials in their own practices. Consideration of instructional and message design principles, types of learning being addressed by the instruction, design of practice components, and integration of sound feedback and assessment mechanisms were often absent in their thinking processes. The ultimate goal of the workshop was therefore to provide guidelines on how instructional designers think and what factors they consider in their design practices. The group was encouraged to seek more understanding of the ID sciences and begin to implement personal reflective practices that engage them in thinking more like instructional designers … to constantly think about the interactions among design, learning, and technology as well as classroom implementation issues. They were encouraged through practice and follow-up discussion to question each component of instructional resources as they are developed. In essence the reflective activities were designed to help them develop the reflective practices that are the hallmarks of senior instructional design specialists.

Reflective Techniques. Many individual and group reflection techniques were used during this workshop to help the content creators think about projects they were currently developing or evaluating. Some reflection began with relaxation techniques to get the audience to 'let go' of preconceived notions of what they were suppose to be doing and focus their thinking on what they know about their learners and the learning environment. This was followed by a reflective drawing activity where the participants were asked to draw a representation of the factors they believed most important in impacting learners in their context. Then, they were asked to reflect on their pictures and write a short narrative of how they saw instructional design principles, learning principles, and technology capabilities reflected in their drawings. Guided reflection was then used to prompt them to think deeply about the relationships among instructional design, learning, and technology in sound ID practices and to honestly assess their own practices. A series of questions was presented to help them think through their activities during a typical instructional systems design processes. At


Figure 2. Content creators reflecting on and sharing examples and tips of their work.

each stage they were asked to write an example of task they completed and how they felt about it, it they believed it added value to the ultimate outcomes, and if they were inspired or motivated at the outcome of the stage. In other words they were asked to assess whether they truly believed that the work they were doing was going to make a difference and could it be used to inform other practitioners. They were then asked to share their example and thinking with colleagues sitting near them. These types *case-based reflections* were designed to encourage collaborative problem solving and practice tips sharing that is found in most effective ID communities. See figure 2.

A Story from Work in the United States …

The problem: Graduate students new to instructional sciences lack understanding of the relationship between instruction, learning, and technology and how this relates to work practices in ID.

Story: This story is about groups of newcomers to the ID community. The first year graduate level ID students, often a diverse group of full-time and part-time students with different academic backgrounds, are required to take core introductory learning and instructional design courses. They often have incomplete ideas about what ID is all about, what ID practitioners do, and how they practice based on theoretical understandings of learning. Students are thus engaged in a variety of activities to learn about, and practice the work of, instructional design professionals. Often the projects are based in some types of technology and require that the final deliverable meet content and design guidelines as well as represent the students understanding of their growing role in the community.

Reflective Techniques: Relaxation, drawing, and writing reflection activities were used throughout the semester in several of the core ID courses. These techniques are used to help students develop reflective practices as they learn about the instructional sciences. Given this is a fast paced world that provides what seems like continuous multiple sound bites of information and activity allows very little time to think in holistic terms and reflect on what we do and why we do it. Students in these courses are engaged weekly in short sessions that prompt them to develop habits and routines helping them clear chaotic thoughts of the day and think in substantial, genuine, and authentic ways about the practices of their profession and the meaning it brings to them. For example, at the beginning of the semester of a core instructional deign practices course, students were encouraged to draw pictures of their conception of their definitions of instructional design (e.g., their roles, tasks, etc.) and then a picture of what they thought their clients' or bosses' definitions and expectations were of them as instructional designers. They we asked to refrain from using words in their drawings. Throughout the semester the students were asked to review their pictures often, sometimes making changes and sometimes adding short narratives on their thoughts and changes. Each reflection session was started with a short relaxation technique and reflections on what inspired or motivated them about the current class session. At times the students we provided with opportunities to share their thoughts before the class was dismissed. This longer process (throughout the semester) promoted students to consider this field as they were learning and practicing inside and outside of class. They were also encouraged to keep a formal written journal of their thoughts on the instructional sciences, what they were learning, and how their learning was inspiring their thinking and practices. Often students were encouraged to share their reflection during class conversations on specific topics. Such activities can move simple journaling and drawing activities from an individual assignment into a dialogue that can inform both the individual on their thinking and the entire class on the diversity of thoughts, ideas, questions, and meaning of ID practices.

Conclusions

> "Reflection [and mediation in the classroom] increases our awareness of ourselves and the world around us… we reflect on and talk about our ideas… and stand at the boundaries of our world as we search for truth and influence practice… (p. 67) the fruit of reflection is meant to be shared." (Litchmann, 2005, p. 81)

Being a member of a professional community comes with expectations of full participation and good practice. All members are responsible for developing an understanding of, and participating in, the work of the community, and ultimately transforming and improving its overall practices. Part of good practice is being self-motivated to participate in quality ways by finding meaning in our work. Reflection is one tool, or perhaps one of our *technologies*, that helps us develop strong ID competencies and practices, a sense of meaningfulness and personal worth of our own work, and helps us leverage our knowledge of practice to others on our collective journey to fully understand and address global issues of enhancing learning environments and providing opportunities for everyone to become productive members of our worldwide society. Good reflective practice takes time and commitment. It is integrated into our enculturation practices (education) and our work. It is individual and collaborative with the best interest of those in the community and those who are impacted by the community in mind. These guidelines and examples are just that, ideas and reports of reflection in action in a single point observation. The results of the impact of these exercises is yet to be assessed. Nonetheless, reporting of such practices is meant to inspire others in our community to investigate these types of activities, explore on personal and professional levels these techniques as possible ways to enhance our community of practice.

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The Current Status and Future Prospects of Corporate e-Learning in Korea

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Abstract

The corporate e-learning in Korea has grown rapidly over the previous six years (2000-2005). This study argues that the main cause of this heightened interest in corporate e-learning in Korea was not that companies needed to provide high-quality training programs through the Internet but that the government took initiative to transform the state into an information-based society. The policies for quantitative growth with minimum levels of quality and uniformity have been dominant and have resulted in the lack of diverse e-learning types for authentic practices in workplaces. This paper suggests that in order to cope with the new competency requirements of employees, corporate e-learning should be guided both by governmental support and by company initiative.

Keywords: Corporate e-Learning, Korea

I. Introduction

Open and distance learning in Korea had not been fully implemented and discussed prior to 2000. Until then, since 1972, systematic formal education for adult learners who did not have the opportunities to enter more traditional colleges had only been provided at such a *mega* university as Korean National Open University (KNOU). Traditional, face-to-face education had been the dominant mode of teaching, while distance learning made up only a small portion of the Korean educational system. However, nine cyber universities, which were established in 2001, and the new Internet correspondence training policy for corporate e-learning by the Ministry of Labor in 1999 initiated profound changes in the Korean educational system (Lim, 2003). Now many Korean adult learners can pursue an education through the various learning technologies of distance learning. Online college courses are delivered via printed material, radio, television, MP3, PMP (portable multimedia player), and the Internet. Also, at present, distance corporate training programs are delivered by mail and online as e-learning.

The unprecedented growth of corporate e-learning in Korea has been a major feature of distance learning since 2000. The Ministry of Labor reported that the growth rate of Internet correspondence training participants was 6,281% over the past six years (19,653 in 1999 and 1,254,066 in 2005) (Ministry of Commerce et al., 2006). While this astronomical figure can be explained in many ways (Lee, 2006) with positive results, its negative effects on corporate e-learning and distance learning have also been noted.

This study intends to discuss the causes and effects of the rapid growth, as well as explore directions for future research and practice with regard to corporate e-learning in Korea. To determine the current issues, the study focuses on the significant developments implemented by a government-funded research center, the Korean Research Institute for Vocational Education & Training (KRIVET), over the past six years (2000-2005). KRIVET impact on the development of corporate e-learning can hardly be overstated (Lee, 2006). The causes of those developments and various resulting problems are examined in this paper. Finally, based upon this analysis, future directions are suggested.

II. Current developments in corporate e-learning in Korea: 2000 - 2005

Corporate e-learning in Korea developed in earnest following the implementation of a new government policy in 1999 on Internet correspondence training. Since then, the development of the field can be measured in five ways: *rapid quantitative growth, government initiatives, dominance of the tutorial mode, quality assurance, and high adoption rate among large corporations*. These will be discussed in turn.

Rapid quantitative growth

One of the salient features of corporate e-learning in Korea over the past years has been its rapid quantitative growth. In Table 1, it may be observed that the number of employees who participated in the Internet correspondence training program or e-learning greatly increased from 19,653 in 1999 to 1,254,066 in 2005 (approximately 63.8 times more). In 1999, only 2.5% of the total number of trainees participated in the Internet correspondence training. But in 2005, that ratio increased up to nearly half of the total number of trainees (46.4%) in 2005.

<Table 1> Number of Trainees Supported by Employment Insurance Act(1999 -2005)

Year	Internet-Based		Postal-Based		Classroom-Based		Total		Internet Training Rate (A/B*100)
	Trainees (A)	Increase rate	Trainees	Increase rate	Trainees	Increase rate	Trainees (B)	Increase rate	
1999	19,653	-	85,055	-	676,700	-	781,408	-	2.5%
2000	137,712	600.7%	161,825	90.3%	920,797	36.1%	1,220,334	56.2	11.3%
2001	406,159	194.9%	199,242	23.1%	950,001	3.2%	1,555,402	27.5	26.1%
2002	543,320	33.8%	197,045	-1.1%	843,958	-11.2%	1,584,823	1.9	34.3%
2003	629,930	15.9%	193,570	-1.8%	838,478	0.7%	1,661,978	4.9	37.9%
2004	929,771	47.6%	283,338	46.4%	790,354	-5.7%	2,003,463	20.6	46.4%
2005 *	1,254,066	34.9%	339,645	19.9%	1,171,630	48.2%	2,705,341	35.0	46.4%

Source: Ministry of Commerce et al. (2006). *E-learning White Paper 2005-2006.*
* The number of trainees in 2005 is projected on the data from the Ministry of Labor in Oct. 2005.

The high growth was due to the expansion of the *Employment Insurance Act*, which earmarked financial support for e-learning programs. The law allowed the Ministry of Labor to begin in 1999 providing institutional support. Thus, the number of corporations and workers that participated in e-learning increased rapidly over the previous 5-6 years. Moreover, corporations took advantage of e-learning, giving more employees access to educational opportunities at relatively low cost. The large corporations quickly adopted the e-learning systems and invested money to develop programs.

The rapid growth of corporate e-learning in Korea can be also attributed to an increase in theoretical studies on corporate e-learning. One of the leading journals on corporate training in Korea is the *Journal of Corporate Education*. This academic journal published its first volume in 1998 in the area of training methods, focusing especially on the applications of different technologies and programs. Not surprisingly, the journal has discussed e-learning with regular frequency since 1999. Of the 13 volumes of the journal, 26 of 79 articles (33%) have dealt directly with the subject of corporate e-learning. Considering the plethora of educational methods and issues in corporate training that could be discussed, devoting over 30% of the journal articles to e-learning is doubtlessly a testament to the rapid quantitative growth of the field as well as the high level of theoretical interest it has garnered in Korea.

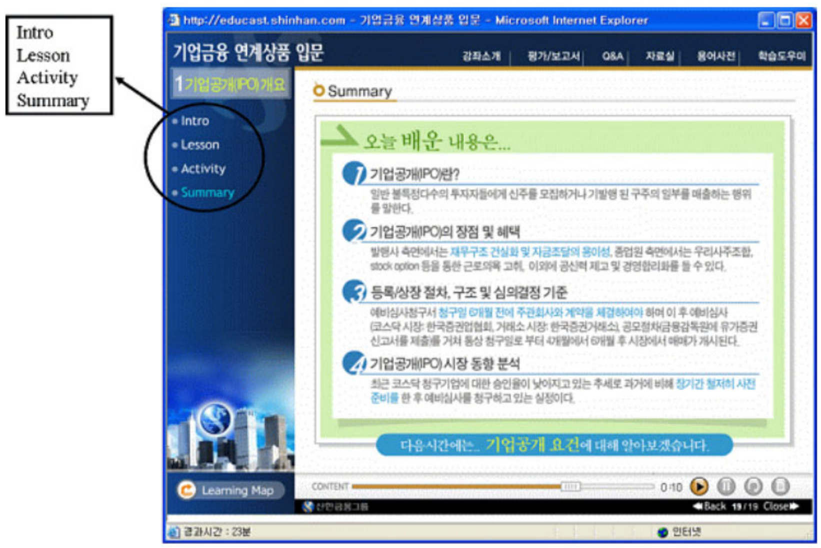
Government initiatives on corporate e-learning

The Korean government, especially the Ministry of Labor, has played a significant role in developing the field of corporate e-learning. In accordance with the government's strategic plan hatched in the mid-1990s to transform the country into a knowledge-based information society, the Ministry of Labor has been the primary driving force behind the implementation of e-learning for corporate training since 1998. That year the Ministry of Labor initiated a pilot project that tested e-learning based training courses, a project which led to the conclusion that correspondence training should include both Internet correspondence training and postal correspondence training and resulted in expansions the following year. This decision caused both corporate e-learning and distance learning for adults to grow rapidly in Korea in 2000 (Table 1). Furthermore, as alluded to previously, the Ministry of Labor established a special division, the *e-Learning Center* at KRIVET, to monitor the quality standards of the e-learning institutes and of the Internet correspondence training program as well as to establish a new support system and make recommendations.

In addition to these early initiatives of the Ministry of Labor, subsequent measures and policies have also been effected since 2000 to boost corporate e-learning (Lee, 2006). In order to support corporate e-learning on a long-term basis, the Ministry of Labor and the e-Learning Center at KRIVET developed the *Corporate E-Learning Mid-Period Development Plan, 2004 -2008*, which proposed strategies covering various aspects of e-learning such as servicing and maintenance of the system, infrastructure construction, cultivation of human resources, standardization, and quality control. Recently, Internet correspondence training regulations have also been revised to incorporate 'blended learning' and a scaled training fee structure, based on an analysis of the quality of the e-learning institutes. Lastly, the worker's tuition support system has been modified as well so that individual workers can receive financial support when they register independently for e-learning programs.

Dominance of tutorial e-learning

Most corporate e-learning courses in Korea are in tutorial format in which major points are supplemented with elaborations and examples ('Intro' and 'Lesson' in Figure 1) followed by practice problems ('Activity' in Figure 1). Various design strategies have been applied—for example, Keller's ARCS (Attention, Relevance, Confidence, Satisfaction) model has been adopted to enhance effectiveness and for animated presentations advanced technologies such as Flash have become standard authoring tools.



[Figure 1] An example of e-Learning: Tutorial type

Table 2 shows that nearly 90% of all e-learning content in 2005 were tutorials in either *HTML*[1] or *Lecture-on-Demand* (LOD) format. The remaining 10% were simulations that honed technical skills. As these two types—tutorials and simulations—became so ubiquitous over the past three years in the field of corporate e-learning, the government's *Employment Insurance Fund* eventually dropped support for other types of e-learning programs.

<Table 2> e-Learning Program Proportion by Types from 2003 to 2005

Types		2003		2004		2005	
		Self developing	Outsourcing	Self developing	Outsourcing	Self developing	Outsourcing
Tutorial	HTML	545 (88.0)	1,086 (79.3)	738 (88.0)	1,005 (68.6)	742 (79.7)	1,082 (80.8)
	LOD	26 (4.2)	212 (15.5)	33 (3.9)	315 (21.5)	83 (8.9)	138 (10.3)
Simulation		48 (7.8)	72 (5.3)	68 (8.1)	146 (10.0)	106 (11.4)	119 (8.9)
Total		619 (100.0%)	1,370 (100.0%)	839 (100.0%)	1,466 (100.0%)	931 (100.0%)	1,339 (100.0%)

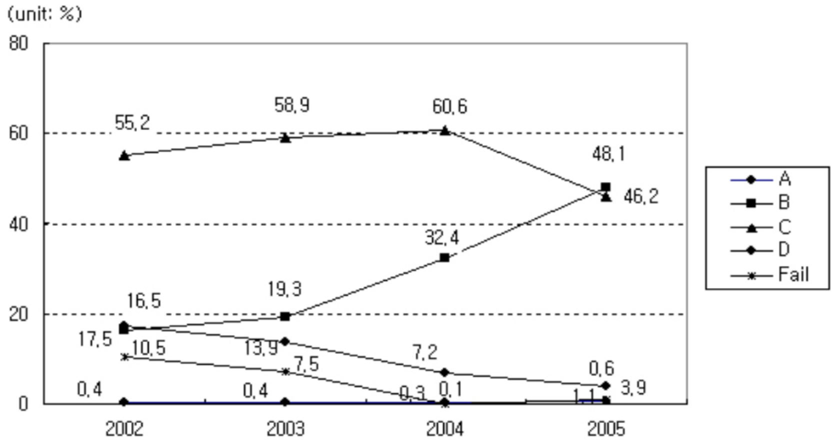
Source: Lee, S. et al. (2006). *Evaluation of Internet Correspondence Training Institutes, Year 2005*. Seoul: KRIVET

Quality assurance

The government, the Ministry of Labor in particular, has tried to assure e-learning quality over the previous few years. In 2002, the e-Learning Center at KRIVET launched an assessment system to judge the appropriateness

[1] HTML in this Table refers to Web-based instruction, in which text, graphics, and some animated objects are displayed in HTML format. LOD(Lecture-on-Demand) refers a type of e-Learning in which lectures by an instructor are recorded and delivered through the Internet at learner's convenience.

of Internet correspondence training programs. All e-learning programs supported by the *Employment Insurance Fund* were required to be evaluated by the Center. As seen in Figure 2, the B level grew annually from 16.5% in 2002 to 48.1% in 2005, demonstrating that instructional design and content quality were indeed improved. Conversely, the proportion of D and F level steadily decreased from 27.5% in 2002 to 5% in 2005. The quality of the e-learning programs was successfully improved by implementing the assessment system.



[Figure 2] e-Learning Program Assessment Results(2002 – 2005)
Source: Ministry of Commerce et al. (2006). *E-Learning White Paper 2005- 2006.*

High adoption rate in large companies

Participation in corporate e-learning programs has not been evenly distributed across the corporate sector. The employees of larger corporations comprise the largest proportion of Internet correspondence training system participants. Table 3 shows that in 2004 just 8% of training participants from the assembly line in small and medium companies participated in Internet correspondence training programs, while nearly 30% of those from large companies did so.

<Table 3> The Proportion of Training Types for Assembly Line Workers by Company Size

(Unit: number, person)

Company Size	Classroom Training		Internet Training		Postal Training		Small & Medium Company Consortium		Field training		Total	
	Programs	Trainees	Programs	Trainees	Programs	Trainees	Programs	Trainees	Programs	Trainees	Programs	Trainees
Small and Medium	1,847 (71.3%)	14,432 (63.27%)	432 (16.8%)	1,877 (8.2%)	300 (11.6%)	6,386 (28%)	3 (0.1%)	22 (0.1%)	8 (0.3%)	90 (0.4%)	2,590	22,807
Large	4,561 (69.4%)	68,565 (58.5%)	1,145 (17.4%)	34,294 (29.2%)	865 (13.2%)	14,401 (12.3%)	1 (0.02%)	1 (0%)	4 (0.1%)	6 (0%)	6,576	117,267

Source: Ministry of Labor, *Unemployment insurance DB,* 2004.

Table 4 further shows that the implementation ratio decreases significantly in relation to smaller company size. In small companies (less than 50 employees), only 10.3% of workers participated, whereas 52.4% of employees did so in large companies (140-299 employees) (Jang & Yoo, 2006).

<Table 4> e-Learning Program Proportion Change by Company size in 2006

Category		Company size			total	difference
		Less than 50 Workers	50 Workers to Less than 149 Workers	150 Workers to Less than 299 Workers		
e-Learning Program	Yes	8 (10.3)	15 (24.6)	22 (52.4)	45 (24.9)	χ^2=23.938 *p<.01*
	No	70 (89.7)	46 (75.4)	20 (47.6)	136 (75.10	
total		78 (100.0)	61 (100.0)	42 (100.0)	181 (100.0)	

Source: Jang, M. H., & Yoo, S. J. (2006). E-Learning Needs Analysis for the Employees of Medium and Small Companies. *Journal of Vocational Education & Training, 9(3),* 175-202.

The Internet correspondence training system appears at first glance to provide broader access to educational opportunities in Korea. It seems to put training within reach of those employees who would not otherwise have such an opportunity. However, in realty, it fails to achieve that goal. Assembly line workers and those employed by small- or medium-sized companies have not received equal opportunities for the Internet correspondence training.

III. Issues in corporate e-learning in Korea

Although there have been great developments in corporate e-learning in Korea over the past six years, there remain certain key problems in the field: *moderate quality, uniformity and controlled growth, limited evaluation criteria, and unevenly distributed adoption rates*.

Moderate quality of corporate e-learning

The quality of corporate e-learning has become an issue that has only been compounded by the rapid growth rate. As mentioned, since the 1999 introduction of e-learning in Korea two formats have emerged as preeminent: one is LOD(Lecture-on-demand) in which the presentation of a lecturer is recorded in motion picture, and the other is Web-based instruction in which text, graphic, and some animated objects are displayed on Web pages as the learners click to progress. LOD has become a dominant format because not only it was easy and relatively cheap to develop but it also conformed to expectations of what training should be (i.e. *lecture delivery at learners' convenience*). A small percentage of e-learning was developed as web-based instruction and most of this type were just copies of printed materials without learners' active participation. These problems were partially remedied when the new assessment system was introduced in 2001. As Table 5 illustrates, growth stalled in 2002 (the number of total institutes decreased from 110 to 93) with the introduction of governmental regulations, of which the assessment system was a key provision. The system succeeded in upgrading the quality of tutorial-type e-learning programs at the expense of other formats. The quality issue will be discussed in more detail in the latter portion of the *quality assurance* section.

<Table 5> Number and Increasing rate of Corporate e-Learning Institutes in Korea(2001 – 2005)

Year	Self-developing		Outsourcing		Total	
year	Institutes	Increasing rate	Institutes	Increasing rate	Institutes	Increasing rate
2001	56	-	54	-	110	-
2002	57	1.8%	36	-50.0%	93	-18.3%
2003	55	-3.6%	33	-9.1%	88	-5.7%
2004	53	-3.8%	55	40.0%	108	18.5%
2005	68	22.1%	80	31.3%	148	37.0%

Source: Ministry of Commerce et al. (2006). *E-learning White Paper 2005-2006.*

Notes: 1. If a company provides both intra-company and outsourcing programs, it will be estimated as outsourcing training.
2. The number of companies conducting more than one training per year.

Uniformity and controlled growth

The government initiative on corporate e-learning in Korea has yielded unexpected results. Although it stimulated the quantitative increase of corporate e-learning programs in a short period of time, one mode of e-learning, tutorial, dominated the e-learning landscape. While the *Evaluation System for Contents and Design Quality of e-Learning* by the e-Learning Center (Table 7) succeeded in upgrading the basic quality of the tutorials, it failed to encourage the development of diverse modes of e-learning programs beyond simple tutorials, and also neglected to support new ideas and studies to help e-learners become self-regulated or self-directed(Lim, 2005). Many e-learners did not successfully complete the e-learning programs in which they had enrolled; they dropped off early on or midway through because they were not self-motivated.

Although tutorial is an effective instructional type for certain objectives, it cannot support some essential objectives and activities, including teaching problem-solving skills, creative thinking skills, and self-directed learning. Yet these are the very skills and experience expected of workers in Korea's knowledge-based society. However, corporate e-learning in Korea currently has not successfully promoted different e-learning models such as Problem-Based Learning, Goal-Based Scenario, and Case-Based Learning (Kang et al., 2006).

In addition, the government, by virtue of their initiative, regulated the growth of e-learning in a way that stifled spontaneous innovation. Most companies assumed a passive role in designing and developing other types of e-learning. The rapid growth of e-learning was achieved without autonomous efforts from the corporate sector. For instance, the possibility of integrating e-learning with the knowledge management system in a company (Rosenberg, 2001) or with long-term blended learning strategies has not been systematically examined, in spite of the high demand.

On the other hand, some alternative designs have been explored from a theoretical standpoint. *The Journal of Corporate Education* in Korea has treated many topics related to *course design*, and secondly, to *learner support* and *cost issues* when those articles from the journal were analyzed by an analytical framework of Rha and Han (2002)[2](Table 6). As this journal mainly focuses on the educational methods in corporate training, especially from the perspective of *educational technology*, this is not an unexpected result. The course design topics covered in the articles included 'strategies for learning motivation in e-learning,' 'design strategies for Goal-Based Scenarios,' 'blended learning strategies', and 'A design model for e-learning.' On the other hand, as e-learning is relatively new to adult workers, learner support issues have been widely discussed. The issue of cost has also been examined because the corporate sector has been particularly interested in determining whether e-learning is cost-effective.

<Table 6> The Topics of e-Learning Studies in Korea (1998 -2006)

Topics	Frequency	Ratio
Course Design	11	42.3%
Learner support	6	23.1%
Cost	4	15.4%
Learner participation	3	11.5%
Learning Contents	1	3.8%
Other	1	3.8%
Total	26	100.0%

Note: The articles from *the Journal of Corporate Education* in Korea were selected for examination

In addition to the *Journal of Corporate Education* other academic journals and periodicals have also discussed topics related to e-learning design. *The Journal of Educational Technology* in Korea, for example, has dealt with issues of corporate e-learning from the perspective of educational technology, notably, issues such as tutoring (Cho & Lee, 2004) and supporting self-regulation (Lim, 2005) have been areas of recent focus.

Limited evaluation criteria

It can be argued that the current perception of quality of corporate e-learning can be attributed to the narrow and ambiguous evaluation criteria. Table 7 shows the current evaluation criteria for e-learning programs. It consists of five dimensions: *instructional design, interaction, evaluation, instructional support design, and technology*. Whereas the dimensions and the sub-criteria do cover important quality aspects of e-learning programs, some problems still exist. First, they focus too narrowly on evaluating the tutorial type of e-learning, virtually assuming that the tutorial format is the only one to assess; other types of e-learning programs such as Case-Based Learning or simulation have not been easily evaluated under these criteria. Second, they do not provide specific guidelines for each criterion. The criteria were ambiguous and judgment could vary depending on the evaluator. More specific guidelines in a rubric format should be developed to make the evaluation more objective and effective for future e-learning programs.

<Table 7> The Evaluation Criteria for e-Learning Programs

Dimensions	Criteria
Instruction Design	Content presentation strategy and method relevancy
	Suitability for supplementary & advanced learning resources
Interaction	Appropriateness of learner-instructor interaction
	Appropriateness of learner-learner interaction
	Appropriateness of learner- contents interaction

The framework suggests *course design, learner support, cost, learner participation, and learning contents* as the major components of e-Learning. *Course design* includes 'the systematic use of instructional strategies', 'the flexible design and change of course', 'active interaction'. *Learner support* deals with 'easy admission and graduation', 'counseling system', and 'stable infra structure and technology'. *Cost* involves such areas as 'low tuition fee' and 'cost-effectiveness'. *Learner participation* examines 'learner involvement', 'learner satisfaction', and 'free choice of course'. Finally, learning contents deals with 'interesting content', 'easiness to accessing information', and 'usefulness of content'.

	Appropriateness of learner-program manager interaction
Evaluation	Appropriateness of method
Instructional Support Design	Appropriateness of help function
	Connectivity of navigation (Interface)
Technology	Technical stability

Source: e-Learning Center in KRIVET (2006)

Unevenly distributed adoption rates

As noted previously, the implementation of corporate e-learning in Korea has mostly been confined to larger companies. Employees of small- and medium-sized companies have not yet fully experienced e-learning programs. To overcome this shortfall, the Ministry of Labor's worker's tuition support system has been recently revised to provide financial support for these underserved workers (Lee, 2006). Further consideration in terms of more access to Internet correspondence training system is needed in order to improve corporate e-learning in Korea.

From a theoretical vantage point, selected studies in the *Journal of Vocational Education & Training* by KRIVET have discussed the issue of supporting medium and small companies, such as by beginning with an e-learning needs analysis of these companies (Jang & Yoo, 2006) and an assessment of e-learning course selection criteria (Kwon, Lee, Rha, & Lim., 2006). These studies were mainly conducted to come up with political implications for the future of e-learning implementations at the national level.

IV. Conclusions: Future directions and prospects

The current development of corporate e-learning in Korea was examined in terms of five aspects: *Rapid quantitative growth, government initiative, dominance of the tutorial mode, quality assurance,* and *high adoption rate among large corporations*. Each one of these also has a corresponding weakness: Rapid quantitative growth has meant that quality has at best been moderate. Government initiative has fueled complacency as companies have hesitated to develop their own e-learning programs for specific purposes such as problem-solving or creative thinking skills. The dominance of the tutorial mode has kept other types of e-learning from being actively designed and implemented. Quality assurance measures have used evaluation criteria so narrow and ambiguous that other types of e-learning contents could not be easily evaluated and the evaluation was susceptible to subjective influence. And finally, the *high adoption rate among large corporations* has translated into workers of small and medium companies not having equal opportunities.

Nevertheless, corporate e-learning does seem to have had a great impact on the recent development of life-long education and distance education in Korea. While the ratio of participants in life-long education in Korea has been relatively low among OECD countries (OECD, 2000), corporate e-learning has played an important role in increasing the rate of participation rate in a short period of time. This increase was mainly due to the government initiative to transform the state into an information-based society where all the aspects of government, including education and training systems, rely on information infrastructure and environments. The Ministry of Labor was no exception, and it took advantage of the *Employment Insurance Fund* to achieve its goal for contributing to the information-based society. Companies were permitted to ask for government subsidy as long as they provided e-learning programs for their employees. Implemented in 2000, this allowance had a significant effect on the growth of corporate e-learning.

In this respect, corporate e-learning in Korea has a unique distinctive. The main impetus for its rapid growth has not been that companies needed to provide high-quality training programs to more workers but that the government took initiative to transform the nation into an information-based society. Most e-learning programs were tutorials that could be made easily, and their common objectives were for acquiring knowledge or understanding content(Lee et. al., 2006). Companies wanted to ensure that employees could do their work competitively or show competency in new areas. They did not want any more workers who just understand basic, factual knowledge. However, competency-related e-learning or performance-based e-learning has not been fully examined yet.

Corporate e-learning can be improved in two ways. First, it should be dynamic rather than static, serving the new requirements of companies and employees. If it remains confined to traditional modes of education or schooling where understanding knowledge can be acceptable as an educational goal, it will be criticized and eventually phased out. It should be responsive to demands for new skills, competencies, or performance, training objectives that can improve employee effectiveness and efficiency. Therefore, the current government e-learning initiative should be changed into one that is directed by both *government* and *companies*, one in which companies play an active, executive role and have a vested interest. Each company should be encouraged to develop and implement advanced and authentic programs autonomously, programs such as an e-learning version of Problem-Based Learning or Case-Based Learning (Kang & Oh, 2006). And the evaluation criteria should become more inclusive and go beyond examining the components of the tutorial. It should stimulate new trials and developments of corporate e-learning programs.

Second, corporate e-learning is a kind of distance learning. Theoretically this provides more possibility to help adult learners access education and training opportunities. Corporate e-learning can provide training to employees who might otherwise never have had the opportunity to train because of their time and space constraints. The initial implementation of corporate e-learning was geared toward large corporations such as Samsung, LG, and SK. These were relatively eager to adopt the program because they considered e-learning to be cost-effective and to provide more training for their employees(Jang & Yoo, 2006). Yet small- and mid-sized companies were not able to offer these programs due to financial constraints. Moreover, they did not recognize the value of e-learning for their workers. To solve this inequality problem, the government should play a key role in encouraging the implementation of e-learning. The Bureau of Small- and Mid-Sized Companies in the Ministry of Labor must come up with effective strategies to mitigate the imbalance, while the consortium of affected companies should take ownership of implementing e-learning. And, government and companies should collaborate to provide leadership aimed at providing opportunities for the disadvantaged employees of these companies.

As mentioned, the unequal access to e-learning should be acknowledged and countermeasures to provide more equal opportunities should be devised, especially for employees for whom e-Learning is relatively new (Piskurich, 2003; Lim, 2005). Considering their schooling experience that focused on passive learning, it is easier to see how it may be difficult for such employees to manage their independent learning, or exercise appropriate self-direction or self–regulation(Lim, 2005) in learning. Providing facilitator intervention or even a new learning management system to encourage and support learner's self-regulation systematically are steps that could mitigate the problems. This issue in terms of supporting learner's self-direction or self–regulation should be studied and examined in further research.

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The development of a method of collecting digital portfolios for Chinese learners of Japanese on an e-learning system

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1. Introduction

As the use of computers and the Internet has spread widely, collecting learner portfolios, especially digital ones, quickly received much attention: the main reason for this is that they are easy to collect with information technology. In the area of language teaching, many researches have been done within the framework of conventional language education and second language acquisition studies. The conventional ways of evaluation most often use a set of standardized tests to measure learners' achievement levels. In contrast, collecting and analyzing digital learner portfolios enables us to evaluate how they have made progress, as well as to measure their achievement levels. In Europe, as European countries were integrated into the EU and more and more people were expected to move within the EU, a new method of measuring linguistic proficiency, called the Common European Framework (Trim et al. 2002), was developed. In this framework, linguistic proficiency is measured by the European Language Passport. By using portfolios, language teachers can collect and store learners' performance data directly from the classroom for a long period of time and in a systematic manner, which enables them to apply the data to developing language pedagogy and to establishing more advanced methods of measuring linguistic proficiency.

Based on these assumptions, we maintain that it is effective to collect digital learner portfolios on a new task-based e-learning system. In this system learners are given systematically organized tasks through the four years at university, their answers are collected via the system, and they complete their Language Passport with the help of their teachers. Teachers can, on the other hand, analyze the long-term data of learners so that they can apply their analysis to better methods of measuring linguistic proficiency. This system focuses on the characteristic features in language education: it is designed to collect the data of how learners understand the meaning of speech sounds and the written characters, how their utterances are given based on the input, and how they write down what they have listened to. Teachers just need to specify the task type, create the questions, and post them on the e-learning system, in order to collect data through the system which automatically gives tasks for learners to do and make answers to.

This paper describes the system we have developed, and the data that can be collected through the system.

2. Design of the system

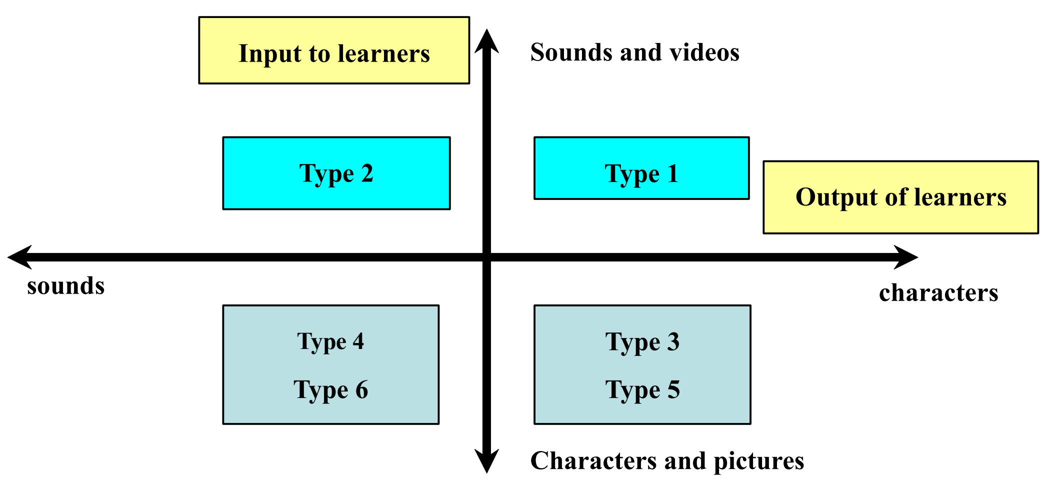


Figure 1: Six tasks

Language learning consists of the four skills: listening, speaking, reading, and writing. Listening and reading are input to the learners, while speaking and writing are output from them. So this system provides the input to the learners, and then collects the output that the learners give to the input. The design of this system is given below.

2.1 Task types and XML-formatted data

If we divide the four basic skills in language learning to input (listening and reading) and output (speaking and writing) as we have just mentioned, each task type will consist of a combination of input and output as shown in Figure 1. This system gives tasks in which questions are put using characters, sounds, pictures, or videos, and the learners' answers are collected in the form of characters or sounds. We have six task types in the current system as shown in Figure 1; we have excluded two types that offer video materials to the learners in order to avoid overload of the system.

type	Offered data	Collected data	Data given to learners	Learners' output collected through:	Example of the task
Type 1	sounds	characters	directions and sounds	text box	dictation
Type 2	sounds	sounds	directions and sounds	voice recording tool	oral quiz
Type 3	characters	characters	Directions	text box	reading quiz
Type 4	characters	sounds	Directions	voice recording tool	reading out loud
Type 5	pictures	characters	directions pictures	text box	speaking what one thought about the pictures
Type 6	pictures	sounds	directions pictures	voice recording tool	speaking what one thought about the pictures

Table 1: Description of each task type

As shown in Table 1, when we create tasks, we do not have to make so many questions. Also, once we decide which task type to use, the interface for learners has only to have text boxes and a voice recording tool. When we want to put questions in Type 1 (dictation), for example, we just need to give directions and sound files; Type 6 (speaking what one thought about the pictures) requires us to just give directions and the picture files. The data structure of the learners' output is decided upon according to the task type. We defined the data structure in the XML format. Table 2 shows samples of the XML-formatted data for Type 1 and Type 6.

```
<?xml version="1.0" encoding="UTF-8"?>
<portfolioT1 xml:lang="ja">
  <name>dictation of a conversation on the Internet</name>
  <question>
    <explain mainlang1="none">This is a conversation on the Internet. Press “play” and write it down.
    </explain>
    <ques mainlang2="none" anslang="none">
      <quesExp></quesExp>
        <examSound>encoded sound data
      </examSound>
    </ques>
  </question>
</portfolioT1>
```

(Type 1)

```
<?xml version="1.0" encoding="UTF-8"?>
<portfolioT6 xml:lang="ja">
  <name>oral descriptions of pictures</name>
  <question>
    <explain>See the pictures below and explain the people in the pictures in Japanese. Record your speaking with the voice recording tool below, and write it down in the box.</explain>
    <ques answrite="1" anstime="30">
      <examPic>encoded picture data 1</examPic>
      <examPic>encoded picture data 2 </examPic>
    </ques>
  </question>
</portfolioT6>
```

(Type 6)

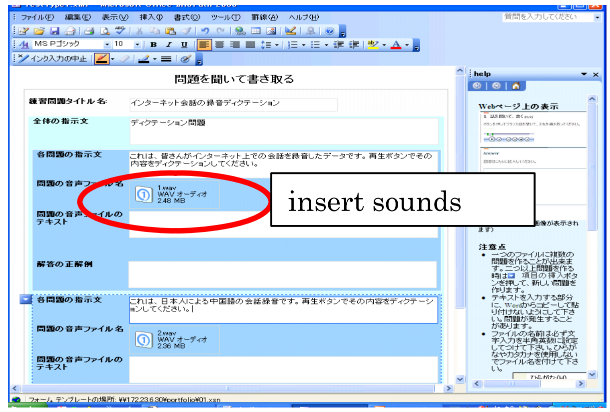
Table 2: XML-formatted data samples for Type 1 and Type 6

2.2 Data entry

Multimedia contents such as sounds and pictures are encoded and inserted into the XML-formatted data as binary data for convenience. We use Microsoft InfoPath to enter the data into the system. We can enter character data into the form, and select files for multimedia contents such as sounds and pictures, which are automatically converted to binary data and inserted into XML-formatted files. Figure 2 is the screenshot of InfoPath when we enter data in Type 1.

2.3 Operation of the system on an e-learning environment

When we collect digital portfolios to create Language Passport for learners, it is efficient to use an e-learning system that can distinguish learners. We have developed a system on which we can post the XML data described above on the TUFS e-learning system that was developed in our university. Figure 3 shows the screenshots of the materials posted on the system. Figure 3(a) shows a Type 6 task, in which learners see the picture, record what they thought about it with the voice recording tool, and submit the data, which will be automatically collected. This example is a task where Chinese learners of Japanese see a picture of a family and they are required to explain the relationship among the family members in Japanese. Tasks in Types 2 and 6 have a text box at the bottom of the page where the learners can write down what they speak, which can render this data easy to analyze afterward. Figure 3(b) shows a Type 1 (dictation) task. Learners press the "play" button, listen to the questions, and write their answers into the text box at the bottom of the page. This example is a task where learners are required to write down a conversation between a Chinese learner of Japanese and a native Japanese speaker.



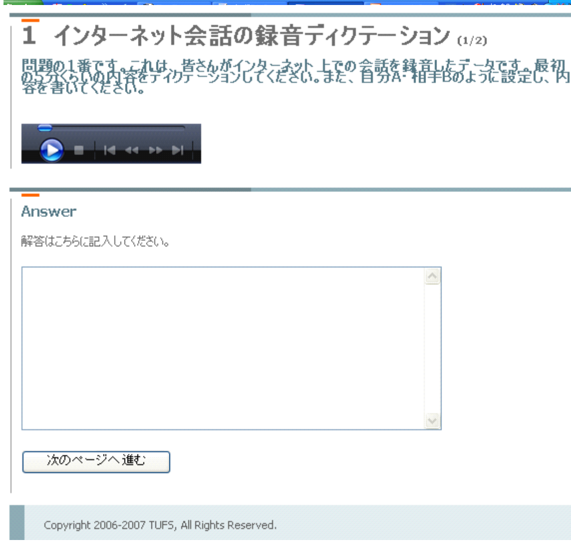


Figure 3(a) Figure 3(b)

Figure 3: Materials posted on the system

The data collected through the tasks are provided to the teachers and learners in the format shown in Figure 4. Figure 4 shows the data collected in the tasks in Type 1 described above. Teachers and learners can obtain the data in the Microsoft Excel format, where the data is linked with the sounds and pictures given to learners.

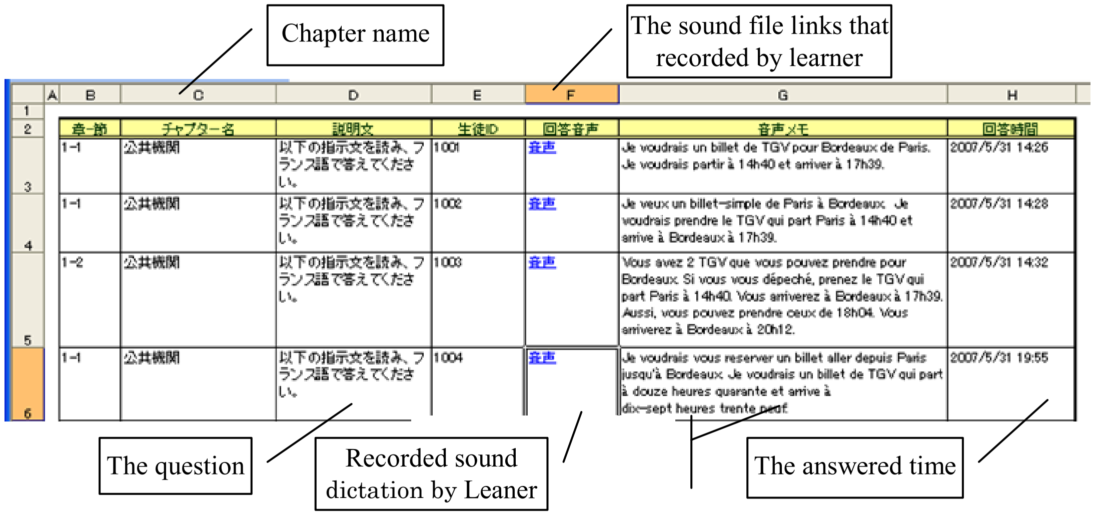


Figure4　The Data collected in the tasks in Type 1

3.　Summary and future work

In language teaching, the Language Passport can be a more effective method of measuring linguistic proficiency than traditional paper-based tests. Collecting and analyzing task-based learner data covering the four basic skills can enable more accurate evaluation of the learners' progress. This paper explained the task types and how we can collect portfolios through an e-learning system. Examples of the tasks given to Chinese learners of Japanese were also provided. We plan to keep collecting portfolios mainly at the levels of A1, A2, and B1 in speaking that are stipulated in the Common European Framework. Analyzing the digital portfolios for learners of Japanese collected in this study will enable us to discover new methods for language teaching.

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Developing an Educational Game of Tangram with Tangible User Interface

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Tangram, an inherited historical legacy, is widely used in learning shapes and stimulating creativity in many countries and areas for both of its shape simplicity and combinatorial complexity. Tangram is an excellent learning material to enlighten children's intelligence and thinking. It helps children to establish the connection between physical objects and geometric forms as well as cultivating imagination, observation, shape analysis and logic. Teachers use tangrams to aid children to learn the general concept of form, vision difference, cognitive technique, vision memory, coordination of hands and eyes, divergent thinking and human relationship. Aside from finding solutions by arranging pieces into a predefined shape, tangram can be used to build creative shaped without any limitations. Though generally tangram is played by a single child, team work is another interesting way to play with such that children can learn how to cooperate and communicate to accomplish a task.

Like many learning materials, digital tangrams had been appeared almost at the time when there were computer games. A multimedia tangram with animation and audio feedback brings more pleasure to the children that can not be found in traditional physical tangrams. However, there are drawbacks for digital tangram games. First, long time of sitting in front of a computer is unhealthy. Second, fixed types of video and audio stimulations are insufficient for the development of child's senses. Third, traditional human-computer-interface device (mouse and keyboard) may not suitable for children who are unfamiliar with the techniques to operate these devices. Finally, traditional interface is suitable for a single player. It is hard to let multiple players to control separately in the same game.

Tangible User Interface (TUI) is a way to expand the traditional human-computer- interface (HCI) using regular input/output devices such as mouse, keyboard and monitor to tangible (graspable) physical objects related to the content of the system. Unlike using an HCI that the user have to memorize the menu and buttons and the correspondence with mouse movement and keystrokes, the user of a TUI can focus on the meaningful objects and manipulate them intuitively. Information engineers have designed many creative applications with TUI to relief the restriction of traditional interface devices. The most natural and intuitive way for a child to play with a tangram is moving physical pieces with hands instead of moving virtual pieces with a mouse and a keyboard.

Following this concept, we developed an educational game of tangram with tangible user interface. The shape of a tangram puzzle is projected on a table with a projector connected to a personal computer. Traditional physical tangram pieces on the table can be moved by the hands of the game player. A webcam is also connected to the computer to scan the pieces on the table. Detection is performed to test if the pieces match the projected shape. If the projected shape is matched in the specified time, animation and audio feedback are generated as reward.

In the scenario described, physical world (tangram pieces and table) and virtual world (projected puzzle) are merged together into a more intuitive interface that even a child without any knowledge of mouse manipulation and keyboard input can still enjoy the fun of the game of tangram. The advantages of physical icons and digital content are retained and merged. The player has to move his/her arms and fingers to move the tangram pieces. Sometimes the player even has to stand up and walk around the table to observe the projected puzzle. Thus prevent the player from the unhealthy status of sitting statically for a long time. By moving pieces, the muscles controlling fingers, hands and arms are exercised. The sense of touch is stimulated by moving and touching pieces. Since the action of moving pieces is intuitive, there is no need to spend time to get used to the interface like the traditional interface. Most interestingly, the physical tangram pieces can be manipulated by several players. Therefore the restriction of a single player in a digital game of tangram is removed. Several players can play the game at the same time. Children can learn social cooperation and competition through the multi-player mode.

It is discovered that, with the introduction of tangible user interface, the advantages and features of physical objects and digital content can be combined together and transformed into an intuitive and creative interface for education and learning.

Strategies Experienced Instructional Designers Use to Obtain Stakeholder Buy-In

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Abstract

This study examined strategies that experienced instructional designers use to obtain stakeholder buy-in, which prior research has not examined. The results of this research showed that experienced instructional designers consider this to be of paramount importance. Results revealed that the most common strategies employed include using design documents, establishing checkpoint reviews, providing design options for stakeholders, using pilot studies, and following up with stakeholders to determine their level of satisfaction with the intervention.

Introduction

This research examined strategies that experienced instructional designers use to obtain stakeholder buy-in during the instructional design process. Instructional Design (ID), or Instructional Systems Design (ISD), concerns itself with the systematic series of steps that are used to create instruction. Several prescriptive models for how ID should be carried out have been proposed over the years, but the one most commonly cited by practitioners is the "ADDIE" model. This model consists of 5 phases: Analysis, Design, Development, Implementation, and Evaluation (ADDIE). An instructional designer is a person who engages in this process in order to create an instructional intervention that addresses specific learning needs on the part of the target audience.

As with any prescriptive theory, however, actual practice may differ. Evaluating prescriptive theories in light of actual practice is therefore useful for advancing the development of new prescriptive theories. This research examined the actual practice of instructional designers in the business/industry setting to determine the specific strategies that they use to obtain stakeholder buy-in. Stakeholders are typically clients or sponsors, and the learners themselves. The need for this research is driven both by the researcher's experience and that of other instructional designers with whom he has spoken, as well as support in the literature for the important role of stakeholders in the instructional design process. While existing research affirms the important role of the stakeholder in the instructional design process, very little explicitly addresses how experienced instructional designers go about obtaining stakeholder buy-in, the situations in which they do so, and how the context determines their strategies. This research benefits all who practice instructional design, and contributes to the body of research on effective instructional design.

Several studies have examined the practice of instructional designers. Generally, these studies examine the practice of novice instructional designers, novice as opposed to experienced instructional designers, or experienced instructional designers. Among these studies, there are a combination of experimental (in which the designers are given an instructional design task), quantitative (surveys), and qualitative (asking the designers to reflect on previous instructional design experiences). These studies typically examine either how instructional designers work, or why (examining their decision-making process, or the learning theories they use).

Kerr (1983) conducted an experiment with 26 novice instructional designers to examine the decision-making process at different points in the instructional design process. Rowland (1992) had a total of 8 novice and expert designers think aloud during a design activity in order to determine what happened within the design process from a problem assessment, solution generation, and decision-making perspective, and the differences between experts and novices. Among other conclusions, he found that experts differed from novices in that they made a lengthy analysis, used a variety of interventions for the solution to the problem, and based their decisions on multiple, global factors (as opposed to single, local factors). Perez and Emery (1995) also investigated differences in novice and expert thinking with 4 expert designers and 9 novice designers through interviews with experts and a think aloud with the novices, finding as Rowland that experts spend more time exploring the problem and consider a wide range of factors in their solution. LeMaistre (1998) examined differences between novice and expert thinking as well, with findings similar to the others.

Of the studies examining instructional design practice, several are oriented towards determining those activities which are employed in professional practice. Wedman and Tessmer (1993) used a survey to gather data from 73 designers to determine the design activities they apply in their projects. The researchers found that designers selectively follow ID model prescriptive guidelines, and that the activities of pilot testing and establishing a need for training were most often omitted (however, they did call for the increased use of pilot testing). Winer & Vasquez-Abad (1995), in a replication of the Wedman and Tessmer study, surveyed 66 designers to determine the degree of use of specific ID activities and the factors influencing their use. Among the results, they found less emphasis on conducting up-front in-depth analysis (such as a needs assessment) and more emphasis on an iterative process of testing and modification. Pieters and Bergman (1995) also used a survey to determine which activities are practiced by designers. Key among their results was the finding that designers consider it important to communicate with stakeholders in order to know how receptive they are to different solutions.

Visscher-Voerman (1999) also studied the activities that instructional designers employ in practice and why they deviate from their general project approach. Visscher-Voerman conducted interviews with 24 expert designers from the Netherlands, and found 16 design principles. Four of these principles make specific reference to obtaining stakeholder buy-in (several others relate to early prototyping and the importance of formative evaluation, which might be important for obtaining stakeholder buy-in). These four principles are:

1) During the design process, designers should pay as much attention to creating ownership with clients and stakeholders, as to reaching theoretical or internal quality of design
2) Designers should not only ask clients and (future) users for content-related input, but should also give them the right to decide about the design itself
3) Designers should ask those with an important role in the development and implementation for their early participation in the design activity
4) A useful means to help clients, partners, and other stakeholders to choose a solution and to formulate product specifications is by showing products from former projects.

The importance of the latter strategy as a means to obtaining stakeholder buy-in is supported by Kirschner, Carr, and van Merrienboer (2002), who used Visscher-Voerman's sixteen principles in a survey of instructional designers.

Several of the studies mentioned above assert the importance of a highly iterative, prototype-based design process. Such a practice might include stakeholders in the process, but this is not the explicit focus of these studies. Visscher-Voerman (1999) does provide support for the importance of obtaining stakeholder buy-in, noting several strategies related to obtaining it, and Pieters and Bergman (1995) and Kirschner et al. (2002) note the importance of communicating with stakeholders to assess their receptivity to potential solutions. Within existing research, however, there is not a specific assessment of the strategies that experienced instructional designers use to obtaining stakeholder buy-in. Research in this area would provide a more in-depth perspective on what previous studies assert to be an important part of the instructional design process.

Methods

The researcher interviewed five experienced instructional designers who have practiced in government, business, non-profit, or education settings. Each interview lasted approximately 1 ½ hours. Each subject had an average of 16.6 years of relevant instructional design experience; the minimum was 10 years and the maximum was 20 years. Those interviewed had performed ISD both from within organizations (as an employee) and from outside organizations (as paid, contract-based, external consultants), though participants spoke for the most part of experiences when they were external to the organization. The participants were volunteers.

Interview questions followed an interview guide approach (a guideline of topics to be covered, rather than a specific list of questions), which allowed for latitude in questioning, and exploration where needed. The participants were informed at the outset that their names would not be used in any published research. All participants were asked not to reveal the real names of the organizations referenced in their interviews, instead saying "one company" or "Company A," etc. Following this, and an introduction to the nature of the research, the researcher asked the following questions:

1. Describe your most recent instructional design project. What were the specific steps that you followed?
2. Who where the stakeholders in the project? What were their initial requirements (if any), how did these change throughout the project, and what role did you play in shaping their expectations?
3. Describe (if not already) the specific strategies used to obtain stakeholder buy-in in this project.
4. Were the strategies effective? How do you gauge stakeholder buy-in?
5. Were there situational or contextual variables that were different in the project that caused you to proceed in a certain way?

These questions were repeated in order to inquire about additional projects as time permitted.

Analysis and Results

All interviews were transcribed, and content analysis performed on the transcriptions. Participants described a range of strategies for obtaining stakeholder buy-in that they employed at different stages in the lifecycle of an instructional design project. First, a table of strategies will be presented, then elaborated upon in the context of the ADDIE model of instructional design.

A list of strategies that were noted in interviews by at least two research subjects is shown in the table below. In general, throughout their interview, each participant returned to certain aspects of the instructional design process that they felt were most important for obtaining stakeholder buy-in. Interview questions were relatively open-ended, and the answers tended to reflect deeply held beliefs that that originate from the experiences of the participants. Therefore, in interpreting the chart below, the reader should consider the commonalities across different stakeholders rather than the exceptions.

Table 1: Strategies Employed to Obtain Stakeholder Buy-In

Strategy	Subject					Percentage Responding
	A	B	C	D	E	
Follow-up with stakeholders to determine satisfaction with intervention – job performance has improved/results achieved	X	X	X		X	80%
Establishing checkpoint reviews	X		X	X		60%
Showing stakeholders several design options from which to choose	X			X	X	60%
Design document			X	X	X	60%
Pilot/acceptance phase			X	X	X	60%
Building trust and building relationships	X	X				40%
Finding out what's important to the client and designing to that		X			X	40%
Speaking in simple terms and proposing simple solutions, particularly in new client relationships			X	X		40%
Asking questions that respect the knowledge of the stakeholders				X	X	40%
Prototypes			X		X	40%
Using stakeholders in the creation of the instructional media	X				X	40%

Participants agreed that the strategies employed may vary depending on the situation. For example, work with first-time clients generally requires particular strategies to ensure buy-in that return clients do not require. Some clients, new or not, may not require as much involvement in the process, and some projects may be straightforward enough that they do not require as much buy-in as more complex or politically-sensitive projects. As for whether strategies varied according to setting (business, non-profit, government, or education), the subjects indicated that while differences might exist (for example, government work requiring formal documentation of the ADDIE approach, or a non-profit emphasis on low-cost solutions), the strategies they employed remained the same.

Instructional Design Process

This section documents the picture of the instructional design process that emerged from data collection and analysis.

Planning

The subjects described an instructional design process, and a process of obtaining buy-in, that often began before the formal "Analysis" phase of the ADDIE model. For example, where a formal client relationship existed (where the participant was external to the organization for which they were working), some subjects placed an emphasis on setting expectations with key stakeholders through a formal written contract. They noted that setting and managing expectations was something that began prior to the start of a project but also continued throughout the project lifecycle. One participant noted, "I have to sell it before I can do it." The participant was not excluding the need for a formal phase of analysis of the learners and their environment, but recognized that an up-front analysis was required to secure a contract and begin a more formal phase of analysis. In this respect, the ADDIE model of instructional design does not fully describe the process followed by experienced instructional designers in paid client relationships. What participants described is more akin to systems design, which begins with a "Planning" phase prior to analysis (see Valacich, George, and Hoffer (2001)). Therefore, the findings include several strategies for obtaining stakeholder buy-in that might first occur as part of a "Planning" phase, though they could also occur at any point during the design process. Each is described below.

Speaking in Simple Terms

Two of five participants spoke of the need to speak in simple, non-technical terms to key stakeholders. This meant avoiding jargon that might not be understood by those unfamiliar with instructional design. Subjects indicated that the need to speak in simple terms was a continual part of communicating with stakeholders, not limited to a particular stage of the instructional design process.

Establishing checkpoint reviews

Three of five subjects talked of conducting periodic, planned reviews of their work with relevant stakeholders throughout the lifecycle of the project. One noted that prior to an engagement she always established when reviews would take place and who would provide sign-off . She noted that this was important even as an internal consultant, since there were different expectations in an organization as to who would be involved in the review of materials, and at what points in the process. Another explained that he followed the ADDIE model, and at least between each stage provided a deliverable for sign-off by the stakeholders involved. In this way he could ensure that the final product would be accepted. A third subject said that he used Microsoft Project to map out his checkpoint reviews and check them off as they were done.

Determining what is "important" to the client

Two participants noted that finding out what is important to the client and designing a solution that takes that into account is essential to a successful engagement. One noted that a company's mission statement was evidence of what the company felt important, and how the organization envisioned itself, and could therefore be used to develop an instructional solution that furthered that mission. A second participant echoed this sentiment in noting that a company's mission, vision, and values were important to understanding what was important to the organization. He also observed that while a particular solution might be appropriate from an educational and ethical point of view, such a solution would not be successful if it did not reflect what the client held valuable.

Building trust

Building trust with the client was another strategy for obtaining buy-in that two of five participants noted. This was a continuous part of the instructional design process rather than a discrete event. Tactics included meeting expectations by delivering a quality product on time. One subject noted that building trust might also involve recommending someone else who was better suited for the work given the project requirements. He explained that clients remembered those who acted in their best interest, and would ask him back on future projects. In one situation the subject described, a salesman for his company had sold a customer training that the salesman claimed would change the culture of the customer's company. When the subject entered the project kick-off meeting and learned of the unrealistic promise, he objected, and the customer called off the project. The subject also observed that building trust was a long-term strategy for obtaining stakeholder buy-in that could span multiple projects with the same client.

Analysis

Asking questions that respect the knowledge of the stakeholders

Asking basic questions (what one participant referred to as “dumb” questions) about the content domain or performance problem was a strategy for obtaining buy-in noted by two participants. One of the subjects, who had extensive experience with those who worked in the electrical construction industry, noted that “Stakeholders want you to recognize or help them express what they know is important.”

Design

Providing stakeholders with several possible design solutions from which to choose

Providing stakeholders with several options for instructional approaches was a strategy noted by three of five subjects . One subject did not continue on a project without getting sign-off on a “proof of concept” – a visual representation of the instruction. She always provided three or more options for stakeholder(s) to choose among when providing such design options. A second subject noted that he always approached stakeholders with stock ideas he uses and asked them what they preferred. In this way, he explained, the stakeholder would feel that they had made a contribution to the project and feel ownership in it.

Design Document

A design document is a document that defines, among other things, the need, purpose, objectives, audience, instructional approach, and intended outcomes of the instruction. Three of five subjects noted that a design document was key to obtaining agreement with stakeholders as to what was important, the nature of the instructional intervention they would pursue, and the expected outcomes.

Development

Prototypes

Two of five participants specifically noted that they created prototypes at the beginning of the development phase to allow stakeholders several different options from which to choose. This strategy is similar to that of providing several different design options during the Design phase. Both strategies are similar in that they provide stakeholders a choice, and therefore a sense of ownership in, the form that the ultimate deliverable will assume.

Using stakeholders in the creation of the instructional media

Two participants noted a strategy for obtaining buy-in specifically in the development of multi-media instruction. They asked stakeholders to play the role of significant characters within the instruction. This might be in the form of photographs, audio, and/or video. One subject noted that their direct involvement overcame resistance to the instruction, especially where technology-based training was new to the organization.

Implementation

Pilot Studies

The use of a pilot study, beta test, or use acceptance phase prior to widespread implementation was commonly noted by several participants. One participant noted that she did pilot studies were the project was large or where there the training was computer-based, in which case a pilot might build acceptance as well as spread word-of-mouth about the course. Another noted that she tried to have actual learners review the content prior to delivering it in-class or online, but that in many cases her pilot study was the first instance of delivering the instruction. In such cases, she would frame the instruction as such and solicit feedback from the learners for adjustment of the next round of instruction.

Evaluation

Follow-up with stakeholders, and call-backs

Four of five participants noted that they would follow-up with stakeholders following the intervention to gauge their satisfaction with the intervention. One described a phone call afterwards as “Sales 101,” and a means of developing and/or maintaining the relationship with key stakeholders. Since participants mostly worked in paid, contract-based engagements, this was a strategy to ensure they maintained stakeholder buy-in even after the project concluded. One subject also described a focus-group approach in which he sat down with key stakeholders to discuss how they felt about the success of the project (or projects). Longer-term, when asked how they determined the success of the instructional intervention and/or obtaining stakeholder buy-in, participants noted that call-backs (i.e., repeat business) indicated previous success.

Discussion and Conclusions

The purpose of this research was to determine the strategies that experienced instructional designers use to obtain stakeholder buy-in. Prior research in this area has not concentrated specifically on this element of instructional design, though research has addressed practice generally. Visscher-Voerman (1999), as noted earlier, studied the practices of expert instructional designers, finding 16 design principles, and 4 specifically related to obtaining stakeholder buy-in:

1) During the design process, designers should pay as much attention to creating ownership with clients and stakeholders, as to reaching theoretical or internal quality of design
2) Designers should not only ask clients and (future) users for content-related input, but should also give them the right to decide about the design itself
3) Designers should ask those with an important role in the development and implementation for their early participation in the design activity
4) A useful means to help clients, partners, and other stakeholders to choose a solution and to formulate product specifications is by showing products from former projects.

In addition, Pieters and Bergman (1995) and Kirschner, et al. (2002) note that instructional designers find it important to communicate with stakeholders to assess their receptivity to potential solution. These principles are congruent with the findings of this study, with one exception. With respect to showing products from former projects, several participants noted that they did not show projects from former projects due to client confidentiality agreements. Showing products from former projects was also a strategy that Kirschner et al. (2002) found as a practice among experienced instructional designers. The idea of providing stakeholders with several design options for comment on and selection from, however, was a similar strategy noted in this research.

In this research, each subject approached the practice of instructional design from a different perspective, placing particular emphasis on certain elements that they found important based on their experience. While perspectives might have differed, however, the picture of the instructional design process that emerged from the interviews was one particularly oriented towards a few common approaches:

- Setting and managing expectations with relevant stakeholders prior to and throughout the instructional design process by speaking in simple, easily understood terms and being realistic about the expected outcomes of the instruction
- Determining what was important to stakeholders and designing a solution that addressed those needs
- Conducting clearly defined checkpoint reviews throughout the instructional design process
- Providing stakeholders with options to choose from, both during the design and development phase

The most important point is that those interviewed saw obtaining stakeholder buy-in as a prerequisite to a successful instructional intervention. Without it, in other words, the intervention could not achieve it objectives. Reasons why this might be the case could vary, but could be because the critical knowledge had not been gleaned by asking questions of those who knew the material, or because those in an organization needed to champion the intervention and/or give it the necessary visibility had not been involved. The importance of achieving stakeholder buy-in to those interviewed indicates the value of this research, both for its intrinsic value in furthering academic discussion on this topic, as well as to practitioners who seek successful instructional design principles.

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A Learner-Centered Instructional Design Model for Distance Learning

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Abstract

Learner-centered instructional design places students' learning needs in the center of the instructional design process. In the learner-centered instructional design model for distance learning, learners' motivational and affective needs are emphasized; steps of creating a learner-centered environment that supports learning strategies are described. This model provides a practical framework to guide the design of learning products for distance education that allow learners to actively construct knowledge and empower students to achieve learning objectives.

Introduction

Instructional design and learning are two different processes, but both relate to and influence each other. Instructional developers produce learning products, such as lessons, courses, and learning environments. Learners interact with learning products to acquire knowledge, skills, and competences (Jonassen, Davidson, Collins, Campbell, & Haag, 1995). The relationship between instructional design and learning is depicted in Figure 1. Learning products directly influence the effectiveness of learning. Different learning perspectives lead to different instructional design principles and processes. The instructional designer should be aware of the guidance of instructional design principles in the learning product design process.

Figure 1. The relationship between instructional design and learning.

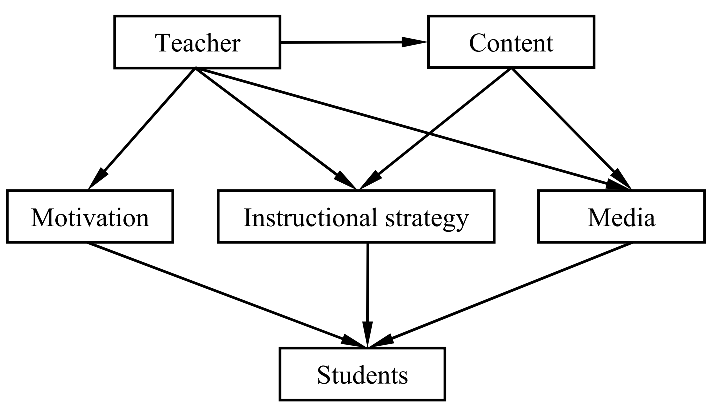

Figure 2. Teacher-centered instruction.

In teacher-centered instruction, teachers control the teaching and learning process (Figure 2). Teachers select media and instructional strategies to present content information and motivate students to learn. An instructional product based on teacher-centered paradigm may benefit some learners but not others. This can be particularly challenging in developing products for distance learners, whose characteristics are diverse. They have different ages, interests, cultural backgrounds, technological skills, learning styles, and prior knowledge.

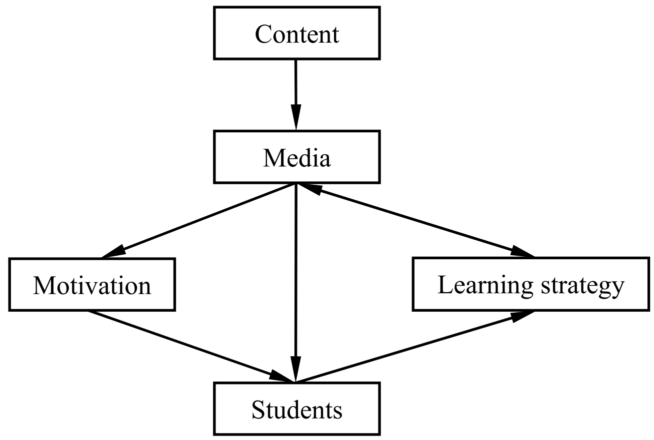

Figure 3. Learner-centered distance learning.

In distance learning, it is better to allow students to control the learning process due to diversity of learner characteristics as well as time and locations. In learner-centered distance learning (Figure 3), students need motivation in learning and use learning strategies to interact with media that present learning content. Information may be pushed to students via media or students actively pull information.

Learner-centered instructional design places students' learning needs in the center of the instructional design process, and will more readily adapt to the diversity inherent in groups of distance learners. The principle of learner-centered instructional design is that the design is based on learner's learning needs, and is for facilitating target learners to achieve learning objectives. The learner-centered instructional design paradigm focuses on the following issues.

- Effectively motivate students to start learning, persist in the learning process, and continue to learn
- Effectively present information (push and/or pull information)
- Effectively provide and support students' learning strategies
- Effectively assess students' learning outcomes

A Learner-centered Instructional Design Model for Distance Learning

The learner-centered instructional design model for distance learning includes five concurrent, overlapping, and recursive components: Understanding learning needs, Analyzing task and Developing learning objectives, Creating a learning environment, Developing learning assessment, Evaluating and revising learning product (UADCDE) (Figure 4). The UADCDE model specifically focuses on the process of designing lessons and courses for distance education.

Understanding Learning Needs

Understanding learner's learning needs is a fundamental step for instructional designers to create effective and efficient learning products. In order to understand learning needs, it is necessary for instructional designers to analyze context as well as learner characteristics, motivational and affective needs, and learning strategies.

One important issue in distance education is determining learner motivation. Different learners have different motivational needs while taking distance courses. Song (2000) identifies three types of motivation in web-based instruction: motivation to initiate, motivation to persist, and motivation to continue. Learners who take a distance education course need motivation to initiate their participation in the learning activities, persist in the learning process, and continue to take other courses after they finish one course.

Learners' affective needs are usually ignored in the instructional design process, partly because they are difficult to conceptualize and evaluate (Zvacek, 1991). However, learners' affective states are closely related to their motivation, thereby influence learning. Thus, it is important for the designer to take these needs into account. One general affective need in distance learning is to know the instructor and other learners who are taking the same course. For example, learners in a course may want to know who the instructor is, what the instructor looks like, and the instructor's qualifications for teaching the course.

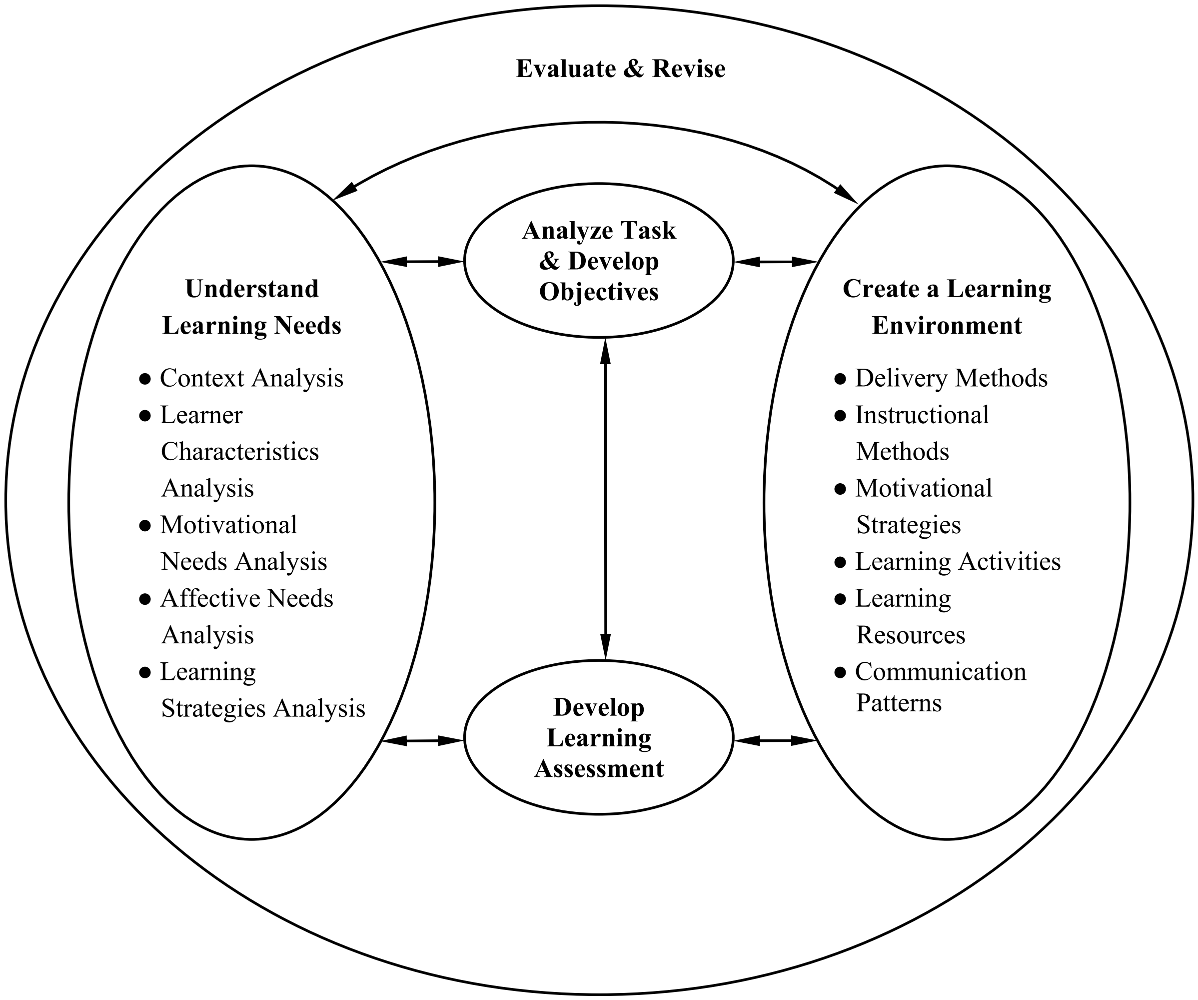

Figure 4. A learner-centered instructional design model for distance learning.

Analyzing Task and Developing Objectives

Instructional designers conduct task analysis in order to develop learning objectives, learning environments, and learner assessments. Learning objectives tell students what they need to learn and what they will be able to perform as a result of the learning process.

Creating a Learning Environment

A learning environment refers to "a place where people can draw upon resources to make sense out of things and construct meaningful solutions to problems" (Wilson, 1996, p. 3). A learner-centered environment enables students to construct meaning through their prior knowledge, beliefs, and cultural practices (Bransford, Brown, & Cocking, 2000). The design of a learning environment relates to learning objectives, learner characteristics, and learners' needs. If motivational strategy and learning strategy support are embedded in content presentation, it will help students overcome barriers in their learning process. Figure 5 presents an example of combining content delivery with motivational strategy and learning strategy support. The creation of a learning environment for distance learning includes selection of delivery methods, selection of instructional methods, design of motivational strategies, design of learning activities, development of learning resources, and design of communication patterns.

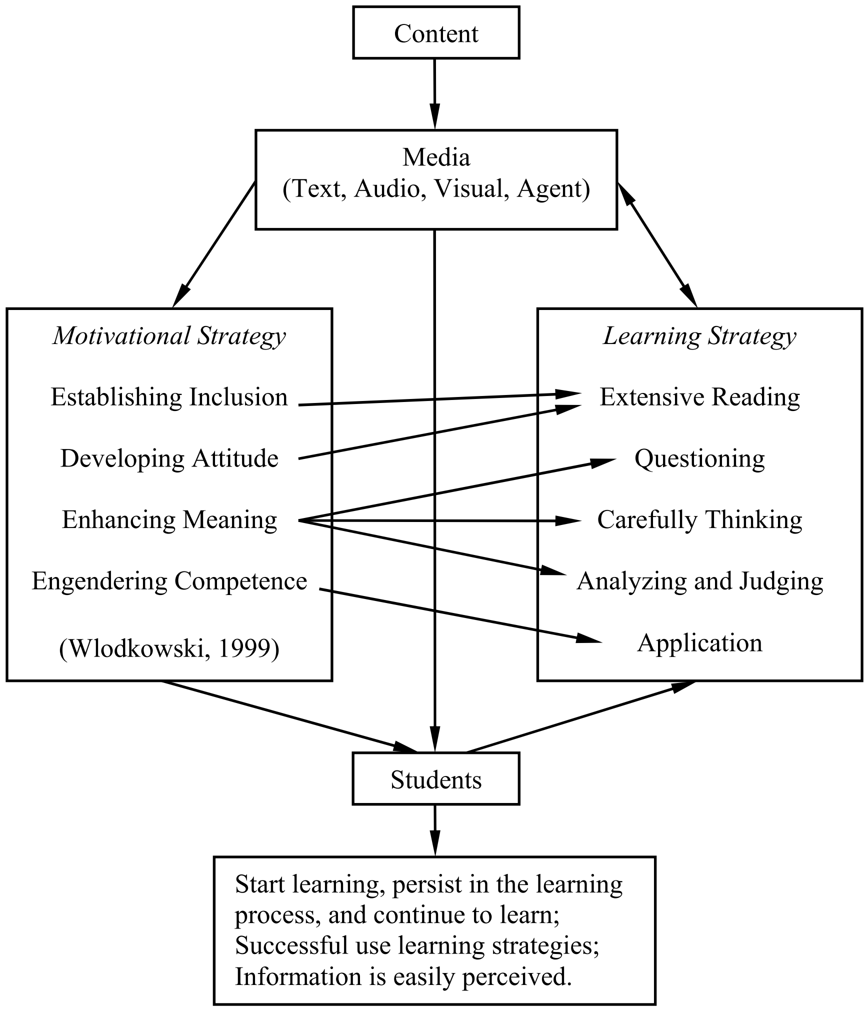

Figure 5. An example of combining content delivery with motivational strategy and learning strategy support.

Selection of delivery methods. Delivery systems are used to provide learning content and support communications in distance education settings. Delivery methods should facilitate achieving learning objectives, support communications, be appropriate for adapting to learners' characteristics and needs, and be easy to set up and maintain (Mehrotra, Hollister, & McGahey, 2001).

Delivery methods in distance education can be synchronous or asynchronous. In the synchronous mode, learning products are delivered to and received by the learners at the same time. Examples of synchronous delivery technologies for distance learning include radio and television broadcasts, two-way audio, and interactive television. In the asynchronous mode, the delivery and reception of learning products occur at different times. The common asynchronous delivery technologies for distance learning include printed materials, audio/video recording, and the Internet.

Selection of instructional methods. Instructional methods are "strategies or techniques used to facilitate intended learning outcomes" (Head, Lockee, & Oliver, 2002, p. 262). Examples of instructional methods for distance learning include lecture, questioning, demonstration, discussion, group project, peer teaching, and role play. The selection of instructional methods in distance education should consider the learning objectives, learner characteristics, and delivery methods.

Design of motivational strategies. One important aspect of learner-centered instructional design is learner motivation. Keller's (1987a, 1987b, 1987c, 1999) Attention, Relevance, Confidence, and Satisfaction (ARCS) model and Wlodkowski's (1999) time-continuum model are two practical frameworks that guide the systematic process of motivational design and motivational strategy selection. Motivational and affective strategies used in distance learning environments should motivate learners to start learning in the environment, persist in the learning process, and continue to study another course after they finish one course (Song, 2000).

Design of learning activities. Learning activities should be designed to encourage learners to actively participate in the learning process through meeting their motivational and affective needs and supporting their learning strategies.

Development of learning resources. Learning resources are the primary sources of knowledge in distance learning. Examples of learning resources include instructional materials, discussion boards, and information on the Internet.

Design of communication patterns. Interaction among learners and instructors is important for successful distance learning experience. Communication patterns can be synchronous (e.g., telephone, instant messenger, online chat, and videoconferencing) or asynchronous (e.g., email and discussion board).

Developing Learning Assessment

Assessment in education traditionally focuses on the evaluation of learners' retention of knowledge and its applications in limited contexts (Reeves & Okey, 1996). The assessment in learner-centered learning environments emphasizes evaluating learners' meaning-making process and performance. The development of learner assessment connects with the learning objectives, learner characteristics, learning environment, and student learning experience. Learning outcomes are directly measured with students' work, such as portfolios, projects, and presentations. It is better to design multiple assessment formats to allow students reflect their multiple aspects of intelligence.

Evaluating and Revising

The evaluation in the UADCDE model includes formative and summative evaluation. The evaluation of learning products includes four themes. First, are learners' learning needs completely understood and included in the learning product? Second, are learning objectives designed appropriately? Third, is the learning environment effective for facilitating learners' knowledge construction? Fourth, is the learning assessment designed appropriately based on the learning objectives, learner characteristics, and the learning environment?

Based on the feedback and evaluation results, all weaknesses found in the steps of understanding learning needs, analyzing task and developing objectives, creating a learning environment, and developing learning assessment will be revised to improve the quality of the learning product.

Conclusion

Learner-centered instructional design emphasizes meeting students' learning needs in the learning product design process. In the learner-centered instructional design model for distance learning, learners' motivational and affective needs are emphasized; steps of creating a learner-centered environment that supports learning strategies are described. This model provides a practical framework to guide the design of learning products for distance education that allow learners to actively construct knowledge and empower students to achieve learning objectives.

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Study of Sharing Technology of Ontology-Based Web Course Resources

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Abstract: In this paper we discuss how to use ontology to realize the course resources sharing in different E-learning systems. We elaborate the features of web course resources based on ontology. And according to the standard of resources development, we discuss the technology of constructing course resources ontology, and also provide an example of course resources ontology. Finally, a framework of Web course resources based on ontology is proposed.

Keywords: E-learning, Ontology, Web Course, Resources Sharing

Introduction

The sharing of course resources is an effective way to improve E-learning quality, and reduce educational cost. China has the most educated people in the world, however, course resources distribute in a disproportion, which restricts educational popularization in some degree (Yang, 2005). The development of Web will promote course resources optimization distribution. So, Web course resources can narrow the gap.

Nowadays, the Web is becoming the most popular educational medium in many fields, such as, at schools, universities, and for professional training.

In fact, because of various factors, the sharing of Web course resources is not working very well (Ding, 2003). Investigations indicate that one main reason of it is that the norm and standard of terms are insufficient (Zhang 2004; Shi & Xiao, 2007). Different teachers describe the same term using different words, which lead to semantic isomerism as follows:

- The Course resources of same subjects adopt different concepts and norms to describe;
- The Same term expresses different meaning in different courses;
- Different systems use different structure to same concepts;
- Concepts in different systems exist various connections, but concepts can’t attain the mutual approbation within systems.

Obviously, above factors make course resources difficult to share within different systems. Although there are initial attempts to develop some technologies for Web-based course resources sharing systems, these researches are still in an embryonic stage (Ding, 2003; Hou, 2004).

In order to solve those problems, ontology (Studer, Benjamins & Fensel, 1998) can be used. Why did we use the ontology? Some of the reasons are:

- To share common understanding of the structure of information among people or software agents;
- To enable reuse of domain knowledge;
- To make domain assumptions explicit;
- To separate domain knowledge from the operational knowledge;
- To analyze domain knowledge.

However, to make Web course resources reused is the main aim in this paper, ontologies include computer-usable definitions of basic concepts in the domain and the relationships among them. They encode knowledge in a domain and also knowledge that spans domains. In this way, they make that knowledge reusable. Ontology-based course resources are the basis of the hypermedia systems to the individual requirements of the learners and ontology-based systems are very promising tools in the area of Web education: In the area of Web education it is important to take the different needs of learners into account in order to propose learning goals, learning paths, help students in orienting in the E-learning systems and support them during their learning progress.

In this paper, we discuss how to construct domain ontology. We find ontologies with a significant degree of structure. These need to specify descriptions for the following kinds of concepts:

- Classes (general things) in the many domains of interest;
- The relationships that can exist among things;
- The properties (or attributes) those things may have.

Features of Web Course Resources Based on Ontology

What are the benefits of the ontology-based web course resources? To sum up the features of ontology and web-based resources respectively, we can find that there are many advantages, such as authority, normativity, sharing, etc.

Authority

When web course resources are built based on ontology, the terms, definitions as well as relations of each domain are drew up by the domain experts. Digital resources developed from these terms and definitions will be authority in its domain.

Normativity

Ontology is built up according corresponding rules**,** usually using the standard language to describe the ontology. Now**, t**he most recent development in standard ontology languages is OWL from the World Wide Web Consortium (W3C) (Horridge, Knublauch, Rector, Stevens, & Wroe, 2004). Therefore the description of the ontology is standard. Web course resources based on ontology will inherit the normativity.

Sharing

Ontology are used to denote domain knowledge which accepted by people. It reflects the recognition concepts collection. Ontology aims at an unit not the individual. So web course resources are built based on ontology will be reusable and sharing, concepts are easily accepted by scholars and teachers.

Ontology of Web Course Resources

To build ontology is a complex thing. Ontology is made up of a series of elements, each of which is composed of a kind of *Relation* and a series of related *Concepts* (Chandrasekaran, Josephson, & Benjamins, 1999). Through an ontology built by the teacher, it will be possible to describe the knowledge domain, the subjects constituting it, the relations among the various subjects, as well as methodologies and means with they are presented.

In the following, we take the process of building “Educational Technology Ontology” (ETO)as an example, explained the methodology of developing ontology- based web course resources, and detailed several key technologies to realize how to share and reuse digital learning resources.

General Development Methodology of Ontology

There are many methods to develop ontology, such as Uschold Methodology, Gruninger & Fox Methodology, Meth Methodology, Knowledge-Engineering Methodology, etc (Staab, Schnurr, Studer, & Sure, 2001; Liu, Xue, & Wang, 2007). Knowledge-Engineering Methodology is used more widely, but it will change according to various areas. It includes:

- Identifying a purpose and scope.
- Terms and concepts capture: Knowledge acquisition, listing important terms, concepts of different domains.
- Building the framework of the ontology.
- Integrating existing ontologies: Reuse of existing ontologies to speed up the development process of ontologies in the future.

- Ontology coding: Structuring of the domain knowledge in a conceptual model.
- Evaluation: Verification and Validation.

Build Web Course Resources Ontology

- **Limitation of general web course resources**

In general, web course resources are presented in the form of text information, multimedia, web pages and so on, which bring it hard to inter-manipulate and make it seriously duplicated construction. By establishing and executing educational resource norm, such as CELTS, SCORM, to some degree, the problem of sharing information exchanging formats between education platforms can be resolved. However, it didn't provide the meaning of information. In other words, educational resource norm can only appoint the syntactic share of the exchanging recourses, but can't appoint it's sharing semantic. Therefore, it is especially important to rebuild web course resources.

- **Methodology of building web course resources ontology**

In fact, there is no single correct ontology-design methodology and we did not attempt to define one. The ideas that we present here are the ones that we found useful in our own ontology development experience. It mainly extracted from Knowledge-Engineering Methodology, and combined features of web course resources.

Domain division: Divide domain according to different subjects, such as computer, educational technology, mathematical and so on. Develop domain ontology according to corresponding subjects, and build specialized ontology to describe the relation among different domain ontology.

Terms collection: Gathered terms of different domain, well-understood domain inner concepts. The terms and concepts of digital learning recourses can be derived from experts, books, network, or even other existing ontology. Here we will use Dublin Core Meta Data Terms to help terms collection, the details will be explained later.

Relation analysis: Ontology provides 4 basic relations: *part-of, kind-of, instance-of and attribut*e-of (Noy, & McGuinness, 2001). These four basic relations cannot express all the relations, thus, it's necessary to define relations according to specific requirement, all the relations should be expressed by accurate terms, and must not have ambiguous.

Coding: Selected ontology language to describe ontology in order to be understood by machines. Common ontology languages include OWL, RDFS and so on.

- **The Dublin Core ontology**

The Dublin Core ontology is based on the Dublin Core Meta Data Terms (The full set of Dublin Core Meta Data Terms is described at http://www.dublincore.org/ documents/dcmi-terms/). The Dublin Core Meta Data Terms were standardized/ developed by The Dublin Core Meta Data Initiative (http://www.dublincore.org/). Dublin Core is a set of metadata elements that can be used to annotate various elements of an ontology with information such as 'creator', 'title', 'subject', etc. So, Dublin Core Meta Data Terms are a set of elements/terms that can be used to describe resources — in our case, we can use these terms to describe the 'resources' such as classes, properties and individuals in an ontology. the following list contains a few examples:

Title — Typically, a Title will be a name by which the resource is formally known.

Creator — Examples of a Creator include a person, an organization, or a service. Typically, the name of a Creator should be used to indicate the entity.

Subject — Typically, a Subject will be expressed as keywords, key phrases or classification codes that describe a topic of the resource. Recommended best practice is to select a value from a controlled vocabulary or formal classification scheme.

Description — Description may include but is not limited to: an abstract, table of contents, reference to a graphical representation of content or a free-text account of the content.

In order to annotate classes and other ontology entities with the above information and other Dublin Core Meta Data Terms the Dublin Core Meta Data ontology (DCOntology) must be imported. Protégé has an automated mechanism for importing the Dublin Core Meta Data ontology. Through it we can import the Dublin Core Meta Data elements

Ontology. It will make us building ontology more easily.

There are four types of basic relations to describe terms' relations in an ontology, they are: *Part-of, Kind-of, Instance-of* and *Attribute-of* (Noy, & McGuinness, 2001). *Part-of* is used to express the concept relationship between part and all. *Kind-of* is used to express inheritance relations among concepts. *Instance-of* means the relations between instance and concept. *Attribute-of* means one concept is the attribute of another one.

But only use the four basic relations mentioned above is not enough. There are many relations can't be described by four basic relations. If we add some considers it will get a better solution.

- Synonyms: For example, in Chinese, "computer" can also be called as "diannao". So in the ETO ontology, we use Synonym-of that we define by ourselves to define the relation above, and the bulk of unified words set can help resolving the problem.
- The ambiguity of concepts: For example, "ATM" refers to a kind of network system in computer network domain. But it can also mean "Automatic Teller Machine" in bank domain. In order to remove the ambiguity, we can adopt domain division to resolve the problem.

While using protégé to build the ontology, we should do:

- Determine the domain and scope of the ontology: In this research, we focus on Educational Technology domain.
- Consider reusing existing ontologies: Through importing the Dublin Core ontology to reuse the Dublin Core ontology.
- Enumerate important terms in the ontology: such as Distance Education, Instructional System Design (ISD), web, etc.
- Define the classes and the class hierarchy
- Define the properties of classes—slots
- Define the facets of the slots
- Create instances

Following is part of ETO ontology:

```
<?xml version="1.0"?>
<rdf:RDF
   xmlns:pub="http://www.domain2.com#"
   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
   xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
   xmlns:owl="http://www.w3.org/2002/07/owl#"
   xmlns="http://www.owl-ontologies.com/unnamed.owl#"
  xml:base="http://www.owl-ontologies.com/unnamed.owl">
  <owl:Ontology rdf:about=""/>
  <owl:Class rdf:about="http://www.domain2.com#Person"/>
  <owl:Class rdf:about="http://www.domain2.com#Publication"/>
  <owl:Class rdf:about="http://www.domain2.com#Article"/>
  <owl:ObjectProperty rdf:about="http://www.domain2.com#isCited">
    <rdfs:domain rdf:resource="http://www.domain2.com#Article"/>
    <owl:inverseOf>
      <owl:ObjectProperty rdf:about="http://www.domain2.com#Citing"/>
    </owl:inverseOf>
    <rdfs:range rdf:resource="http://www.domain2.com#Article"/>
  </owl:ObjectProperty>
  <owl:ObjectProperty rdf:about="http://www.domain2.com#hasAuthor">
    <rdfs:range rdf:resource="http://www.domain2.com#Person"/>
    <rdfs:domain rdf:resource="http://www.domain2.com#Article"/>
  </owl:ObjectProperty>
  <owl:ObjectProperty rdf:about="http://www.domain2.com#isPublished">
    <rdfs:range rdf:resource="http://www.domain2.com#Publication"/>
    <rdfs:domain rdf:resource="http://www.domain2.com#Article"/>
  </owl:ObjectProperty>
```

```
<owl:ObjectProperty rdf:about="http://www.domain2.com#Citing">
  <owl:inverseOf rdf:resource="http://www.domain2.com#isCited"/>
  <rdfs:domain rdf:resource="http://www.domain2.com#Article"/>
  <rdfs:range rdf:resource="http://www.domain2.com#Article"/>
</owl:ObjectProperty>
<owl:DatatypeProperty rdf:about="http://www.domain2.com#keywords">
  <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
  <rdfs:domain rdf:resource="http://www.domain2.com#Article"/>
</owl:DatatypeProperty>
<owl:DatatypeProperty rdf:about="http://www.domain2.com#hasTitle">
  <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
  <rdfs:domain rdf:resource="http://www.domain2.com#Article"/>
</owl:DatatypeProperty>
<owl:DatatypeProperty rdf:about="http://www.domain2.com#content">
  <rdfs:domain rdf:resource="http://www.domain2.com#Article"/>
  <rdfs:range rdf:resource="http://www.w3.org/2001/XMLSchema#string"/>
</owl:DatatypeProperty>
<owl:SymmetricProperty rdf:about="http://www.domain2.com#bothCited">
  <owl:inverseOf rdf:resource="http://www.domain2.com#bothCited"/>
  <rdfs:range rdf:resource="http://www.domain2.com#Article"/>
  <rdf:type rdf:resource="http://www.w3.org/2002/07/owl#ObjectProperty"/>
  <rdfs:domain rdf:resource="http://www.domain2.com#Article"/>
</owl:SymmetricProperty>
<owl:SymmetricProperty rdf:about="http://www.domain2.com#bothCiting">
  <rdfs:domain rdf:resource="http://www.domain2.com#Article"/>
  <rdf:type rdf:resource="http://www.w3.org/2002/07/owl#ObjectProperty"/>
  <rdfs:range rdf:resource="http://www.domain2.com#Article"/>
  <owl:inverseOf rdf:resource="http://www.domain2.com#bothCiting"/>
</owl:SymmetricProperty>
<pub:Publication rdf:ID="Info.Sci."/>
<pub:Person rdf:ID="Keegan"/>
<pub:Article rdf:ID="KB_757266_Individual_3">
  <pub:hasTitle rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Distance Education</pub:hasTitle>
  <pub:isPublished rdf:resource="#Info.Sci."/>
  <pub:keywords rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  >Distance Education</pub:keywords>
  <pub:content rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
  > Distance Education is ….</pub:content>
  <pub:Citing>
    <pub:Article rdf:ID="KB_757266_Individual_2">
      <pub:hasTitle rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >ISD</pub:hasTitle>
      <pub:isCited rdf:resource="#KB_757266_Individual_3"/>
      <pub:Citing rdf:resource="#KB_757266_Individual_3"/>
      <pub:isPublished rdf:resource="#Info.Sci."/>
      <pub:hasAuthor>
        <pub:Person rdf:ID="Gagne"/>
      </pub:hasAuthor>
      <pub:content rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >ISD is ….</pub:content>
      <pub:keywords rdf:datatype="http://www.w3.org/2001/XMLSchema#string"
      >ISD</pub:keywords>
    </pub:Article>
  </pub:Citing>
  <pub:hasAuthor rdf:resource="#Keegan"/>
```

<pub:isCited rdf:resource="#KB_757266_Individual_2"/>
</pub:Article>
</rdf:RDF>

Ontology Languages and Realization Tools

There are many languages to describe ontology, such as Ontolingua, KIF, RDF, RDFS, OWL, etc (Corcho, Fernάndez-López, & Gómez-Pérez, 2003). Different ontology languages provide different facilities. The most recent development in standard ontology languages is OWL from the World Wide Web Consortium (W3C). It can describe concepts and also provides new facilities. It also has a richer set of operators and negation.

We can build on our experience using Protégé (Noy, Fergerson, &Musen, 2000), WebODE (Arpírez, Corcho, Fernandez-Loopez, & Goomez-Peerez, 2001), and OntoEdit (Sure, Erdmann, Angele, Staab, Studer, & Wenke, 2002) as ontology-editing environments. In this paper, we use Protégé3.1 (new edition) to build ontology.

A Prototype System Based on Ontology

System Architecture

In this research, we have designed the Ontology-based Web Course Resources Sharing System (OWCRS). It consists of three parts (as shown in Figure 1): Data layer, Middle ware layer and Application layer.

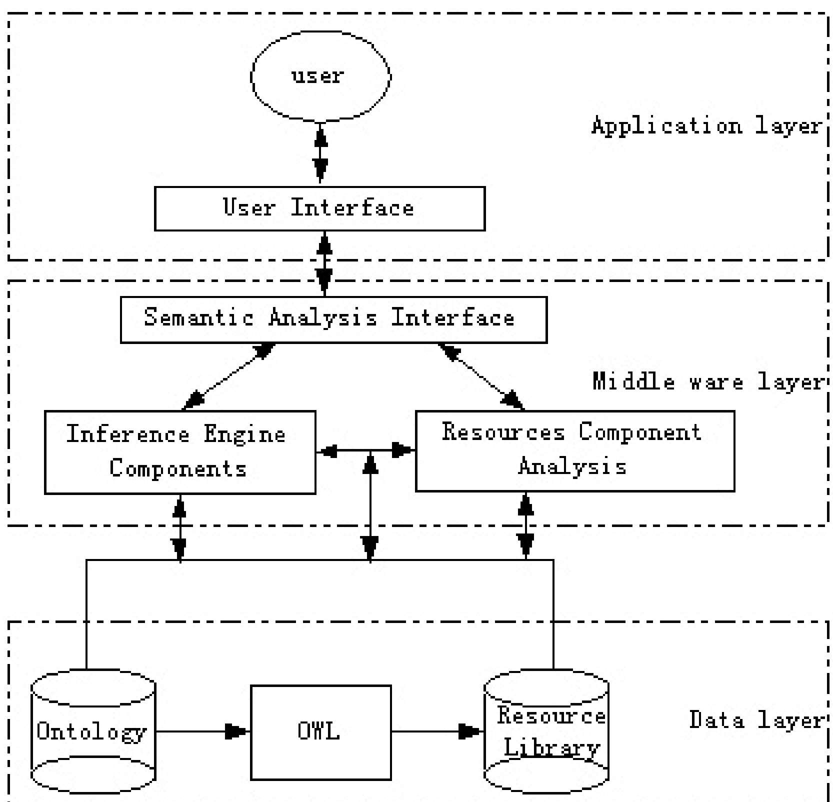

Figure 1. Ontology-based web course resources sharing system

Data layer: It realized the resources denotation which based on ontology. Using OWL file format to describe web course resources, it contains rich and complex relations among different entities. So it provides models and methods of the organization, management, retrieval and inquiries for the knowledge. This is the basis of sharing resources, and is the core of the system.

Middle ware layer: Achieving OWL reasoning. The system will read OWL file from the location where we have saved the ontology, and store in a specific model for further processing, then reason according to certain rules. This is a crucial step to realize the system.

Application Layer: The interface that users access to web course resources. It mainly provides users with a friendly interface to achieve the right web course resources, and the future of resource sharing system.

Some Key Techniques of the System

Being based on a different logical model, we can use a reasoner (such as Racer) when build ontology. It can check whether or not all of the statements and definitions in the ontology are mutually consistent and can also recognize which concepts fit under which definitions. The reasoner can therefore help to maintain the hierarchy correctly. This is particularly useful when dealing with cases where classes can have more than one parent.

When reasoning, we can use relations below: *inclusion (c, d)*, *equivalent (c, d)* and *disjoint (c, d)*. The most frequently used type inclusive relationship that is *inclusion (c, d)*. When Class A contains Class B, it means that all examples in Class B must be examples of Class A. It can realize by ModelFactory.createOntologyModel or ReasonerRegistery.getOWLReasoner( ) to visit reasoner engine. For example:

```
String resourceowl=”file: ETO.owl”;
Model schema=ModelLoader.loadModel(“resourceowl”);
Reasoner reasoner=ReasonerRegistry.getOWLReasoner();
Reasoner= reasoner.bindSchema(schema);
InfModel infmodel=ModelFactory.createInfModel(reasoner,schema);
```

Following is part of reasoning rules for resources citing relations in searching:

```
bothCiting: (?a http://www.domain2.com#Citing ?c),(?b http://www.domain2.com#Citing ?c),notEqual(?a,
?b)->(?a http://www.domain2.com#bothCiting ?b)
bothCited: (?a http://www.domain2.com#Citing ?b),(?a http://www.domain2.com#Citing ?c),,notEqual(?b,
?c)->(?b  http://www.domain2.com#bothCited ?c)
```

Realization of the System

The system uses Eclipse, Myeclipse and Tomcat as a development environment, Java as the main developing language. Data layer make use of Protégé3.1 ontology editing tools and use Knowledge-Engineering Methodology to build domain ontology, and save as OWL ontology files. Middle ware layer use semantic analysis to schedule all the components, functions and ontology. Jena 2.4 is used as a reasoner tool to reason OWL files and analyze resources. Application Layer is the main user interface and to show the reasoning result.

Conclusions and Future Work

In this paper, we presented the OWCRS system, which can realize web course resources sharing based on ontology. We firstly probe into the methodology of building web course resources ontology, using Artificial Intelligence research and internet technology for reference, and making full use of modern informational technology and international opening resources. Then we study the technology and method of web course resources sharing. But in practical, we faced many difficulties. Such as it depends on more manpower participated in while built the ontology. In the future, the research will focus on automatically separating and extracting resources. We believe that such a system would identify any referred object on the web, and its significant category and attribute-value information. Such a repository would be a valuable resource for scalable querying, integration and mediation over the web.

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A Research of Interactive Ambient Space for Storytelling

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Storytelling is a good way to fulfill children's happiness and enrich their imagination. The essential practical knowledge, social value, morality, and ceremonial in the human society can be learned by the children unobtrusively and imperceptibly. Storytelling is also a way to let children learn to interact with people such as discussing the story and telling the story to others. Moreover, children could promote their language ability by discussing and talking to others.

Traditional storytelling is a "one-way, stable and abstract" communication between the storyteller and the children. The children listen to the story from storyteller and occasionally interact with storyteller. The story is usually from a book or what the storyteller heard before. The story will be told repeatedly with stable script and content without modification. Since the story is told by speech and voice, the children have to imagine and turn the abstract information about characters, scenes, objects, etc. into perceivable images in their brain. However, storytelling nowadays has become more sophisticated and become a "two-way, dynamic and diversified" communication. The children can listen to the story and play with the storyteller. Sometimes the storyteller may modify the script of the story depending on the feedback of the children. With digital technologies and electronic devices, diversified audio and visual content are added to enhance the effect of storytelling.

It is essential for a storyteller to express the ambience of the story. With the aid of digital media, modern storytellers are able to attract the audience and make learning more interesting. Moreover, some storytellers build houses to incorporate storytelling with interactive technology. This new style of "house of storytelling" merged with digital environment and ambient space. To attract children to a house of storytelling, the space is designed with concepts extracted from computer games. There are concepts from hardware such as ambient stages, plentiful stage properties, spot light, music and sound effects and from software such asking the audience questions, let the audience make selection about the important events and repeating a scenario until the audience understand the consequence of the story. All the new concepts make the audience from passive to active. Information technologies such as virtual reality and augmented reality can be embedded in the storytelling space to create a space similar to a film of three dimensions. The audient is not merely "listen" to the story, they can "play" and "interact" with the story. Our goal is as far as possible to embody the content of stories.

A prototype of interactive storytelling space to incorporate with the "two-way, dynamic and diversified" features extracted from computer games was developed to test the new style of storytelling. Digital content like animation and pictures were projected to the walls of the space. Music and sound effects were played by hidden stereo speakers to match up the movement of characters in projection. Several scenarios were designed to be interacted with the audience. No traditional interface such as mouse and keyboard were used to create an emerging ambient space. Computer vision technology was used to capture the image of the audience and detect their body movement. The audience could see themselves in the projected space and interacted with the virtual characters and scenes of the story. The interface of body movement is intuitive. The children did not need the knowledge of mouse control and keyboard input. They could just move their bodies, wave hands, stretch legs and any actions they like to play with the story. Since linear scenario and single ending of storytelling are traditional story structures, we considered that structure could be diversified for modern storytelling so that the audience was willing to the same story again and enjoyed the unpredictable and multiple results. Arborescent scenarios and endings were introduced into the story with key timestamps that the audience or storyteller could decide the preferred scenario. With the concept of interactive storytelling, the children become the main role who guides the development of the story. It was discovered that, when interactive technology was introduced, storytelling became more interactive and constructive. The children were more attracted by the dynamic and entertaining features of interaction. They were more active in the communication with the storyteller and other children. The learning also was more effective and less obstructive. Children are surely mankind's future; however, nowadays parents have fewer children so that they are willing to let their children go to the house of storytelling even though it costs much money. Therefore, it is required to develop a better mold for storytelling and let children learn more happily.

Creating and Implementing Conversational Agents

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Abstract

First, this paper discusses the use of the Artificial Intelligence Markup Language (AIML) for the development of a conversational agent's knowledge base. Second, this paper discusses two approaches to implementing conversational agents. One implementation option available to instructional designers is to run a conversational agent on a web hosting service capable of interpreting AIML tags. Alternatively, an instructional designer could develop a unique environment for implementation purposes.

Introduction

This work considers text-based conversational agents. Embodied conversational agents (Cassell, Sullivan, Prevost, & Churchill, 2000; Graesser, McNamara, & VanLehn, 2005; Ruttkay & Pelachaud, 2004) or, as Plantec (2004) describes them, V-people (virtual people) are animated characters capable of simulating human conversation. While animated characters provide greater novelty than textual delivery media (Clark & Choi, 2005), instructional effectiveness is of paramount importance to educators.

Conversational agents offer instructional technologists an opportunity to design and to develop instruction that responds to student requests. Software that implements a conversational agent seeks to hold a seemingly intelligent conversation with the learner in order to help the learner meet instructional objectives. To hold an intelligent conversation, a software agent must access a knowledge base. First, this paper discusses the use of the Artificial Intelligence Markup Language (AIML) in order to create knowledge bases of conversational agents. Second, this paper contrasts two methods for implementing a conversational agent. Using the first method, instructional designers can create a knowledge base in AIML and import it to a web hosting service. As discussed in the first section of this paper, creating a knowledge base in AIML requires the inclusion of markup tags around conversational text. Also as noted below, this process has been automated. Consequently, an instructional designer can create the knowledge base of a conversational agent by writing question and answer sequences. The second approach requires computer programming, which is more complex than creating AIML and importing the knowledge base to a hosting service. Although the second approach is more complex, creating a custom made conversation permits instructional designers to implement unique features not available in hosting environments.

Using AIML to Develop the Knowledge Base of a Conversational Agent

The Artificial Intelligent Markup Language (AIML) was developed by Richard Wallace (see http://www.pandorabots.com/pandora/pics/wallaceaimltutorial.html) and conforms to the rules of the Extensible Markup Language (XML). As such, AIML features tags similar to ones in XML and other language derivatives, such as the Hypertext Markup Language (HTML) and Voice XML. Accordingly, familiarity with HTML or XML would be helpful when learning AIML, but such knowledge is not required. Although AIML is not a part of the work of the World Wide Web consortium, AIML provides an XML-compliant standard for the creation of a knowledge base. The latest version of AIML (version 1.0.1), which became stable in March 2005, contains 40 tags. For a complete list of the tags, see http://www.alicebot.org/documentation/ptags.html. Discussion of all AIML tags is well beyond the scope of this paper. Nevertheless, the subset of AIML tags illustrated in the following examples serves to highlight key features of the markup language.

One can construct a knowledge base using three basic AIML tags: <category>, <pattern>, and <template>. In AIML, knowledge is represented within the <category> and </category> tags and knowledge is conceived of as a linguistic stimulus-response pair. The stimulus appears within <pattern> and </pattern> tags and the response appears within <template> and </template> tags. Whenever the words within the <pattern> tags are encountered, the conversational agent responds with the words within the <template> tags. The following example is a complete AIML script capable of responding only to the question: Where is Anaheim?

```
<?xml version="1.0" encoding="UTF-8"?>
<aiml version="1.0">
      <category>
            <pattern>WHERE IS ANAHEIM</pattern>
            <template>Anaheim is in California</template>
      </category>
</aiml>
```

In the preceding script, the first statement is required for implementation purposes in order to convey that the tags in the script are XML-compliant. The second line identifies the script more specifically as containing AIML tags. The script, which is a strikingly simple conversational agent, can be executed at the following URL.
http://www.pandorabots.com/pandora/talk?botid=a0350a2c3e36fe9e
Keep in mind that you will receive the response only when you ask the question: Where is Anaheim? Those three words must be spelled correctly. The letters of those words may be entered in any combination of uppercase and lowercase letters. Entering the question mark is optional.

The following AIML example could be used to tutor novice computer users who have yet to learn how to open application programs. In order for a human tutor to help such novice users, the tutors must be able to remember what was said recently. This is also true of conversational agents implemented through computer software. In AIML, the <that> tag enables a conversational agent to recall its last utterance. This is illustrated in the following example.

```
 <?xml version="1.0" encoding="UTF-8"?>
<aiml version="1.0">
      <category>
            <pattern>HOW DO I OPEN MICROSOFT WORD</pattern>
            <template>On what operating system do you want to run word</template>
      </category>
      <category>
            <pattern>HOW DO I OPEN MICROSOFT EXCEL</pattern>
            <template>On what operating system do you want to run excel</template>
      </category>
      <category>
            <pattern>MAC OS *</pattern>
            <that>On what operating system do you want to run word</that>
            <template>Click the Word icon in the palette</template>
      </category>

      <category>
            <pattern>MAC OS *</pattern>
            <that>On what operating system do you want to run excel</that>
            <template>Click the Excel icon in the palette</template>
      </category>

      <category>
            <pattern>WINDOWS *</pattern>
            <that>On what operating system do you want to run word</that>
            <template>You may be able to double click a Word icon on the desktop; otherwise, proceed through the
Start button, to Program Files, to Microsoft Office, to Word</template>
      </category>

      <category>
            <pattern>WINDOWS *</pattern>
            <that>On what operating system do you want to run excel</that>
            <template>You may be able to double click an Excel icon on the desktop; otherwise, proceed through the
```

```
Start button, to Program Files, to Microsoft Office, to Excel</template>
    </category>
</aiml>
```

The preceding example can be executed at the following URL:
http://www.pandorabots.com/pandora/talk?botid=be1e1c203e36fe91
This example demonstrates that all conversational transactions in an AIML knowledge base appear within the <category> … </category> pair of tags. Second, note that the asterisk (*) is a wildcard character that matches any input. Consequently, in response to the operating system question posed by the conversational agent, the user can enter Mac OS X or Windows 95, Windows XP, or any other text after either MAC OS or Windows and a match will be found. Then, the conversational agent's reply will depend on whether the agent previously asked about running Word or Excel. Whichever operating system and application pair is of concern, the response in the appropriate <template> … </template> tags will be displayed. For instance, if the agent asked: "On what operating system do you want to run excel" and the user responded, Windows XP, the agent would reply with: "You may be able to double click an Excel icon on the desktop; otherwise proceed through the Start button, to Program Files, to Microsoft Office, to Excel."

The use of numerous categories in the previous example is inefficient because the procedure for opening Microsoft applications is uniform. Indeed, even though only the name of the application changes, a new category must be inserted into the AIML for each new Microsoft application. To eliminate this inefficiency, a variable can be assigned the name of the application entered by the user. This is shown in the following example.

```
<?xml version="1.0" encoding="UTF-8"?>
<aiml version="1.0">

    <category>
        <pattern>HOW DO I OPEN MICROSOFT *</pattern>
        <template>On what operating system do you want to run <set
name="app"><star/></set></template>
    </category>

    <category>
        <pattern>MAC OS *</pattern>
        <that>On what operating system do you want to run *</that>
        <template>Click the <get name="app"/> icon in the dock.</template>
    </category>

    <category>
        <pattern>WINDOWS *</pattern>
        <that>On what operating system do you want to run *</that>
        <template>You may be able to double click the <get name="app"/> icon on the desktop;
otherwise, proceed through the Start button, to Program Files, to Microsoft Office, to <get
name="app"/>.</template>
    </category>

</aiml>
```

This example can be executed at the following URL:
http://www.pandorabots.com/pandora/talk?botid=8ee67b9bde36fe90
In AIML, the <star/> tag contains the text associated with the asterisk wildcard character. Consequently, in the script above, the <star/> tag will contain the name of the Microsoft application the user wants to open when the user asks a question like "How do I open Microsoft Outlook." The agent uses the name of the application entered by the user to pose the operating system question. This could have been accomplished with the following AIML:

```
<template>On what operating system do you want to run <star/></template>
```

For the script to function properly, however, the name of the Microsoft application entered by the user must be saved in a variable. This is accomplished in the example above by enclosing the *star* tag in a *set* tag, as in <set name="app"><star/></set>. The use of a variable is vital because the initial value of the *star* tag (i.e., the name of the Microsoft application entered by the user) is overwritten when the user responds to the operating system question. Once the user has responded to the operating system question, the conversational agent responds with suitable instructions for opening the application. Notice that the *get* tag (i.e., <get name="app"/>) is used to display the name of the Microsoft application entered by the user.

Other AIML tags provide conversational agents with additional capabilities, including, but not limited to the ability to: reply randomly to user input; respond to grammatical variations expressing the same utterance; assign a gender to the agent; and to assign a name to the agent. For a tutorial on the tags that enable these and other features, see http://www.pandorabots.com/botmaster/en/tutorial.

Implementing a Conversational Agent

One may implement a conversational agent through a free hosting service. Alternatively, one may develop a unique environment. Both approaches are considered here.

Agent Hosting Services

Anyone with a knowledge base that conforms to the AIML specification can implement their conversational agent, which may also be called a *bot*, at a free hosting service. *Pandorabots* (http://www.pandorabots.com) is an example of such a free service and was used to implement the three examples in the previous section.

To implement conversational agents at *pandorabots* one first creates an account by supplying one's first name, last name, email address, and password. Once logged in, a conversational agent can be created in three steps. First, click the link called *Create a Pandorabot*; supply a name for the *bot* and if you have your own AIML, select the last radio button, which starts the *bot* with no initial content or knowledge. Second, click the AIML link in the top menu bar. At this point you may upload an AIML file or click the link called *Create a new AIML file*. If you take the latter option, then copy and paste your AIML categories into the form; supply a file name and click the web form's submit button, which is labeled *Save as*. After the uploading or copying-and-pasting step, the last step is to publish the agent: Click the *My Pandorabots* link; click the radio button beside the name of the bot you just created; ensure that *Publish* is selected in the drop-down menu; and click the *Go* button. This completes the bot implementation process by displaying the hyperlink to your conversational agent.

Even without AIML, one can create a conversational agent at *pandorabots* with conversational text like the following four lines.

Hello, how are you?

Hi, I am fine.

Where is Anaheim?

Anaheim is in California.

In this case, *pandorabots* creates AIML categories, complete with *pattern* and *template* tags. To experience this conversion, you could enter the four lines above, or some other conversational text in which each utterance is separated by a blank line, into the form at http://www.pandorabots.com/botmaster/en/aiml-converter.html and then click the convert button.

Another possibility for hosting a conversational agent involves the installation of free AIML processing software on a personal computer. Since the source code is often available, this approach creates the possibility of extending the system in order to provide unique features. To pursue this implementation option, see the installation details at http://www.alicebot.org/downloads/programs.html or http://www.alicebot.org/aimlbots.html.

Custom Implementation

Creating a custom agent requires skill in computer programming whereas implementing an agent in AIML demands only the inclusion of *category, pattern* and *template* tags around conversational text. This is the biggest difference in the two approaches and a considerable disadvantage of custom development. However, in addition to holding a conversation, a custom agent can be programmed to provide additional services. For example, a conversational agent acting as a tutor may be able to diagnose learner errors and provide feedback intended to help learners correct their errors. This is precisely the type of functionality this author sought to provide to students learning how to create web pages in order to fulfill the portfolio requirement of a technology teacher preparation course.

By writing unique code in PHP (a hypertext preprocessing language), the author has created and implemented A Web Tutor (A.W.T. or, more simply, AWT) that converses with students in order to help them create web pages. In addition to providing answers to questions about web page development, AWT provides lessons that often include step-by-step instructions. Further, AWT provides diagnostic and feedback features that help students identify "broken hyperlink" and "image not found" errors in their web pages. One may perceive of the tutor's conversational, tutorial, diagnostic and feedback capabilities as a kaleidoscope, capable of offering unique experiences to individual learners within a domain of practice.

Learners communicate with AWT by typing a question into a text field on a web page. Specifically, learners can ask AWT the following questions:

- What is all the fuss about the World Wide Web?
- What is a web browser?
- What is a web server?
- What is HTML?
- What is a web page?
- What is a home page?
- What is a URL?
- What is a web site?
- What is a web crawler?
- What is a search engine?
- What does FTP mean?

In addition to asking those questions, a learner can ask AWT the following questions in order to learn how to complete various tasks concerning web page development.

- How do I access my portfolio web space?
- How do I create a web page?
- How do I publish a web page?
- How do I edit a web page in Netscape Composer?
- In Netscape Composer, how do I insert a hyperlink?

With respect to diagnosing any errors in the addresses of images and relative hyperlinks, learners can enter "check my web page" or "check my web page named xxxx.yyy" (where xxxx can be any file name and yyy is either htm or html). Upon encountering either of those directives, AWT retrieves the particular web page (either index.html or the specific page identified in the directive); detects any errors in the relative hyperlinks and in the references to images by parsing the HTML of the web page and retrieving the file names of all files in all folders of the student's web space; and provides feedback. The feedback identifies any errors in the URLs of the images and relative hyperlinks; states the cause of each error; and provides a remedy to fix the error. Given the feedback, the learner can ask additional questions, which will prompt AWT to provide step-by-step instructions for performing the remedies.

The conversational capabilities of AWT are limited at this time, but continued development is planned in light of current research. Future versions of the software will improve upon three main aspects of the system, particularly: (1) The tutor's conversational ability, which will enable the tutor to reply to more questions; (2) The tutor's knowledge base, which will permit the tutor to provide additional lessons and will permit each learner to try alternative approaches if the learner is not satisfied with the initial set of instructions; and (3) The tutor's interface, which will send the tutor's output through a text-to-speech engine to an animated character in order for the tutor's comments to be rendered as voice output through an avatar.

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The Effect of Animation in the Design of Instructional Messages

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Abstract

This research study investigated the relationship of two types of visual presentations and their effects on college students' cognitive load performance and knowledge transfer. 112 graduate students enrolled in an introductory statistical course and an educational research course at a mid-west university participated in the study. The research design incorporated animated visual display and static visual display of a statistical concept as instructional message design strategies with controlling for prior knowledge and spatial ability. Results indicated that students in the animation group had significantly higher knowledge transfer score than those in the static visual group. Students in the animation group also had significant higher mental efficiency score than those in the static visual group.

Introduction

In instructional design technology, inconclusive results have been obtained in animation research studies (Large, 1996; Park & Hopkins, 1993; Rieber, 1990). Positive learning effects have been found in some studies (Atkinson, 2002; Blankenship & Dansereau, 2000; Craig, Gholson & Driscoll, 2002; Mayer, 1997; Mayer & Anderson, 1991; Mayer & Moreno, 2000; Mayer & Sims, 1994; Mayer & Anderson, 1992; Park, 1998; Park & Gittelman, 1992). However, no significant learning effects have been found in other studies (Ausman, Lin, Kidwai, Munyofu, Swain & Dwyer, 2004; Rieber, Boyce & Assad, 1990; Rieber, 1996; Rieber & Hannafin, 1988; Rieber, 1989; Zhu & Grabowski, 2004). Controversy still exists about whether animation assists in learning or produces no effect. Large (1996) points out that the results of animation studies have been "contradictory and inconclusive" (p. 9). According to Ausman et al. (2004), without careful consideration of the message and systematic design, animation may do "more harm than good" (p. 49). It is apparent that there is a need to further investigate the effect of animated instructional messages to provide learners with an instructional environment where concept acquisition and retention can be effectively transferred and meaningfully connected to their cognitive loads.

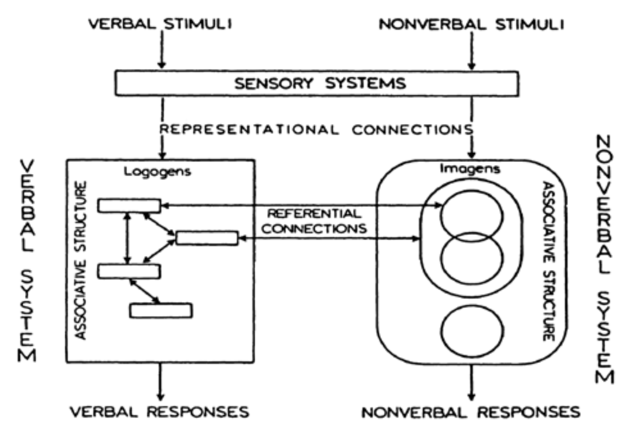
Related research and theory

The present study adopted dual coding theory, cognitive load theory, and multimedia design model to construct the design experiment. Paivio's dual coding theory has been widely used in multimedia instructional design (Mayer & Anderson, 1992; Mayer & Moreno, 1998; Mayer & Moreno, 2002; Mayer, 1997). The theory believes that cognition consists of two systems: one is the nonverbal system, which represents and processes visual image information; the other one is the verbal system, which represents and processes language information. Both systems are separate but can be referentially connected (Sadoski, Paivio & Goetz, 1991).

The two systems have different organizational characteristics. The verbal system processes information in sequence, but the nonverbal system processes information in a synchronous or parallel manner (Paivio, 1986). The cognitive activity starts when the sensory system finds either verbal or nonverbal stimuli. Representational connections are made to find corresponding systems. These representations are formed hierarchically in the system. In the verbal system, representations are formed in a sequential and logical order. In the nonverbal system, representations are formed in a holistic way. For example, the eyes, nose, and mouth can be viewed separately but are usually viewed as parts of the face (Sadoki, Paivio, & Goetz, 1991). See Figure 1 for reference.

Figure 1. Dual Coding Theory

Dual coding theory: Verbal and nonverbal representation systems



Note. From *Mental representations: A dual coding approach* (p. 67) by A. Paivio, 1986. New York: Oxford University Press. Copyright 1986. Reprinted by permission.

Associative connection refers to the organization within a system. For example, a spoon can make you think of an entire table setting. Referential connections refer to inter- system relations. For example, when the word *table* is said, you can picture a table in your mind. Dual coding theory emphasizes both associative processing and referential processing (Sadoki, Paivio, & Goetz, 1991).

Dual coding theory provides this research study with a theoretical framework. Based on Paivio's dual coding theory and Mayer's multimedia learning model, the program design will use both verbal and imagery systems. The purpose is to optimize the sensory registry and make sure that the extraneous cognitive load is low; therefore, learning will be enhanced.

Cognitive load theory identifies three kinds of cognitive loads. One is intrinsic cognitive load; one is extraneous cognitive load, and another one is germane cognitive load. Intrinsic cognitive load means that either the learning material has a lot of elements to assimilate or that learning these elements involves interactivity. Extraneous cognitive load refers to the instructional technique (Sweller & Chandler, 1994). Germane cognitive load refers to the effects of variability in materials presented to learners (van Merriënboer & Sweller, 2005).

According to cognitive load theorists, a human's short-term memory is extremely limited, while long-term memory has a huge capacity for storing information. Building schema automation is a very crucial step for learning. If automation recognition occurs, the learning process will bypass the working memory and go directly to the long-term memory to retrieve information. In this way, the working memory capacity will be freed to allow other cognitive activities (Sweller & Chandler, 1994).

Cognitive load theory provides researchers with an instrument to measure *mental load* from a task-based perspective and *mental effort* from a learner-based perspective (Sweller, van Merrienboer, & Paas, 1998). Mental load can be measured by using the number and interactivity of learning elements, while mental effort can be measured by using subjective, physiological and performance-based indices (Sweller, van Merrienboer, & Paas, 1998).

Richard Mayer has been researching whether combining different instructional strategies with animation can produce better learning outcomes. His research shows that providing students with only verbal explanations will not help students learn scientific concepts. In order to achieve the best results in learning scientific concepts, multimedia learning models need to be provided. Mayer's research studies further demonstrate that prior knowledge and spatial ability can influence the learning outcomes (Mayer, 1997). If prior knowledge and spatial ability can influence the learning outcomes of utilizing a multimedia learning model, what will happen if we control these variables, and will learning outcomes differ? Mayer's research helps to form the research questions and the research design, which will use both animation and narration of the text in order not to increase the cognitive load and optimize selective perception function.

Purpose of the study

The purpose of study was to exam the effects on students' cognitive load performance and knowledge transfer by types of visual presentations. The first focus of the design was to measure whether animation and static visual display created different amounts of mental load and whether learners exposed to different instructional strategies would impose different mental efforts on performance. The second focus of the design was to measure whether animation and static visual display could improve knowledge transfer ability. To test these assumptions, the following research questions were proposed:

- Does the type of instructional strategy affect performance on knowledge transfer tests, controlling for prior knowledge, visualization and spatial orientation?
- Are the mean scores on mental efficiency the same or different for students in the two instructional condition groups?

The null hypotheses are that there is no difference on the mean scores on knowledge transfer tests for students in the two instructional condition groups, controlling for prior knowledge, visualization and spatial orientation. There are no differences on the mean scores on mental efficiency for students in the two instructional groups. The alternative hypotheses are that there is difference on the mean scores on knowledge transfer tests for students in the two instructional condition groups, controlling for prior knowledge, visualization and spatial orientation. There are differences on the mean scores on mental efficiency for students in the two instructional groups.

Research method

The study was a quasi-experimental design using analysis of covariance (ANCOVA) to test knowledge transfer. ANCOVA analysis tests whether the population means on the dependent variable vary across levels of a factor, controlling for covariates (Green & Salkind, 2005). In this study, two groups were compared. One was animation group. The other was static visual display group. One dependent variable, knowledge transfer test scores were compared. Three covariates were prior knowledge, visualization and spatial orientation. The independent variable was instructional strategy which included two levels with one being the animation and another being the static images. Animation is generally defined as a dynamic visual display and static images is generally defined as static visual display (Anglin et al., 1996; Park, 1998).

Participants

The participants were 112 graduate students enrolled in an introductory statistical course and an educational research course at a mid-west university. Participants were randomly assigned to two different instructional strategies: an animated visual display group and a static visual display group. Sixty participants served in the animation group and fifty two participants served in the static visual display group.

Procedures

Prior to the experiment, each participant was tested on prior knowledge on sampling distribution, spatial orientation and visualization. Participants were then randomly assigned to either a computer program that used animated instruction, or another computer program that used static visual instruction. Upon completion of the instruction, participants took knowledge transfer tests and reported their mental effort score.

Computer Programs

The computer program for animation was designed and developed by Rice University Statistics Lab and the researcher. The animation program used Java Applet. The researcher used Adobe Captivate 2.0 to create the interface and the knowledge transfer test. The computer program for static visual display was designed by the researcher by using Adobe Captivate 2.0. The concept to be presented in the programs was that of the sampling distribution of means in an entry level graduate statistics course and educational research course. The animation program allowed subjects to pick the number of observations and the number of the samples. Based on the subject input, the program generated the concept of random sampling. Static visual display program presented the key frames of sampling distribution. Previous research had shown the positive effect of adding narration into the software so that cognitive load would be reduced and students can combine verbal and visual systems together based on working memory theory and dual coding theory (Mayer & Moreno, 1998; Mayer & Sims, 1994; Mayer & Anderson, 1992; Paivio, 1986). Narration was used in both animation and static display groups in this research study.

Scoring

The primary author scored all the paper tests. There were five questions in the prior knowledge test, and each question weighted 2 points. There were altogether 40 questions in the spatial orientation test. Each question weighted one point and the total was 40 points. There were 5 questions in the visualization test, and each weighted 1 point. The total was 5 points. Knowledge transfer test had five questions and each weighted 2 points. The software was programmed to return the score when all questions got answered.

Mental efficiency score was used to test the mental effort subjects used to understand the concept. Cognitive mental load is generally defined as the number and the interactivity of the learning elements (Sweller, van Merriënboer, & Paas, 1998). Mental effort is defined as "the amount of cognitive capacity or resources that is allocated to accommodate the task demand" (Sweller, van Merriënboer, & Paas, 1998, p. 266). The focus of the study is to see whether animation and static visual display create different amounts of mental load, whether learners exposed to different instructional strategies will impose different mental efforts on performance, and whether different instructional strategies will help students apply what they have learned into real life situation.

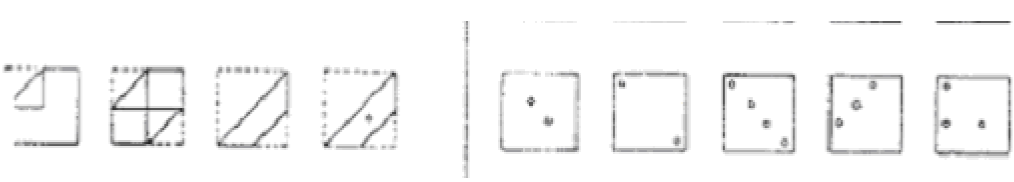
Spatial orientation and visualization test

The spatial orientation and visualization test designed by *Educational Testing Service* was used to gather information for two of the controlling variables, spatial orientation and visualization. The test of spatial orientation was testing mental rotation, while the visualization assessed both mental rotation and the ability of performing serial operations. Both visualization and spatial orientation require mental rotation in short-term memory, but visualization requires more component of performing spatial operations (Ekstrom, French, Harman, Dermen, 1976).

According to Mayer and Sims (1994), spatial visualization was the most relevant aspect to learning from animations, so only spatial orientation and visualization tests will be used to examine students' spatial ability in this research. In spatial orientation test, students were asked to decide whether each of the cards on the right was identical or different from the card at the left. All of these drawings are of the same card, which has been slid around into different positions on the page. If the card cannot be made to look like sliding it around on the page, then choose D (different), otherwise, choose S (same). See Figure 2 for reference. For the visualization test, some figures were displayed at the left of a line, and others displayed at the right of the line. Figures at the left represent a piece of paper being folded, and one or two circles on the paper indicating where the paper was punched. Figures at the right represent where the holes would be when the paper was unfolded. In visualization test, students was asked to decide which one of the figures at the right showed where the holes would be when the paper was unfolded (Ekstrom, French, Harman, Dermen, 1976). See Figure 3 for reference. Spatial orientation and visualization test was administered as a pencil and paper test. The test will be distributed to the subjects before the computer programs.

Figure 2. Card Rotation Test

Figure 3. Paper Folding Test



Mental load and mental effort test

Mental effort score was gathered at the end of the intervention. Students reported the mental effort they used when either computer program is presented to them to understand the concept of sampling distribution. The mental load and mental effort test was based on Borg 's study on aspects of mental load (1978). After receiving the computer instruction, each participant reported their mental effort score. The score was designed to gather information on the effort used to solve a specific task. The procedure was based on the assumption that the subjects can introspect on their cognitive processes and report how much mental effort they spend on each task (Marcus, Cooper, Sweller, 1996). A 7 - point self report scale was used to measure students' perception of amount of mental effort. This 7 – point response scale is designed by Nadine Marcus, Martin Cooper, and John Sweller. The scale categories are (1) very easy, (2) easy, (3) fairly easy, (4) neither easy nor difficult, (5) fairly difficult, (6) difficult, and (7) very difficult (Marcus, Cooper, & Sweller, 1996).

Reliability of the knowledge transfer tests was constructed. The Cronbach's alpha value for the knowledge transfer test is medium with a value of 0.4. Based on the assumption that the data are multidimensional, factor analysis is performed and the results review that question two and five are measuring the same latent construct, question three and four are measuring the same latent construct, and question 1 are measuring one latent construct. All rotated factor loadings are high for all the similar constructs. The results confirm that the reliability for questions two and five are high, the reliability for questions three and four are also high.

Prior knowledge test and knowledge transfer test

The prior knowledge test measures how much statistical information subjects have already grasped before being exposed to the intervention. The knowledge transfer test measures whether subjects can apply the knowledge they have just learned into solving a real life statistical problem. Both tests are statistical exams. Prior knowledge test was administered as a pencil and paper test. Knowledge transfer test was imbedded into the computer software.

Results

A one-way ANCOVA assesses whether population means on the dependent variable are the same across levels of a factor, adjusting for differences on the covariate (Green & Salkind, 2005). This research study tests whether population means on the dependent variable knowledge transfer test are the same across levels of a factor, adjusting for differences on the covariates prior knowledge, spatial orientation, and visualization tests.

Four assumptions are needed for the ANCOVA test. Assumption 1: the dependent variable is normally distributed in the population for any value of the covariate and for any one level of a factor (Green & Salkind, 2005). This assumption is met. Assumption 2: the variances of the dependent variable for the conditional distributions described in assumption 1 are equal (Green & Salkind, 2005). Levene's test of equality of error variances is performed and result $p = 0.003$ is significant, indicating that the variances are not equal. The possible explanation for this result is that the group sample sizes differ. Animation group has 60 participants joined the study and static visual group has 52 participants joined the study. Assumption 3: the cases represent a random sample from the population, and the scores on the dependent variable are independent of each other (Green & Salkind, 2005). All the subjects participated into the study are graduate students who registered educational statistics I course and educational research course. They are randomly selected from the population. Assumption 4: the covariate is linearly related to the dependent variable within all levels of the factor, and the weights or slopes relating the covariate to the dependent variable are equal across all levels of the factor. This assumption is also called as homogeneity-of-slopes assumption (Green & Salkind, 2005). Homogeneity-of-slopes assumption has been tested. The test evaluates the interaction between the covariate and the factor in the prediction of the dependent variable knowledge transfer test. The interaction source is labeled group * prior knowledge, group * spatial orientation, and group * visualization. The results suggest the interaction for group * prior knowledge is not significant, $F\ (2, 105) = 3.184$, $p = 0.045$, partial $\eta^2 = 0.057$. The results suggest the interaction for group * spatial orientation is not significant, $F\ (2, 105) = 2.512$, $p = 0.086$, partial $\eta^2 = 0.046$. The results suggest the interaction for group * visualization is significant, $F\ (2, 105) = 6.008$, $p = 0.003$, partial $\eta^2 = 0.103$. Non-significant results will assume homogeneity of slopes. Two of the interaction effects are not significant with moderate effect size. One interaction effect is significant with moderate effect size. The ANCOVA test is proceeded assuming homogeneity of slopes.

The results of the ANCOVA analysis indicate that the null hypothesis should be rejected, F (1, 107) = 21.240, $p < 0.01$, and the partial η^2 of 0.166 suggests a strong relationship animation group has on knowledge transfer tests, controlling for prior knowledge, spatial orientation, and visualization tests. The relationship between the prior knowledge and knowledge transfer test is not significant, F (1, 107) = 0.669, p >0.05, with the covariate accounting for about 0.6% (the partial η^2 of 0.006) of variance of the knowledge transfer test for animation group. In this study, the relationship between the spatial orientation and knowledge transfer test is not significant, F (1, 107) = 0.668, p >0.05, with the covariate accounting for about 0.6% (the partial η^2 of 0.006) of variance of the knowledge transfer test for animation group. The relationship between the visualization and knowledge transfer test is significant, F (1, 107) = 5.431, p <0.05, with the covariate accounting for about 4.8% (the partial η^2 of 0.048) of variance of the knowledge transfer test for animation group.

The correlation results show that there is moderate correlation exists between knowledge transfer and visualization, with $r = 0.207$ and $p < 0.05$. It can be concluded that 4% of the variance ($.207^2$) of the visualization is accounted for by its linear relationship with knowledge transfer. There is low correlation exists between knowledge transfer and spatial orientation, with $r = 0.123$ and $p > 0.05$. There is low correlation exists between knowledge transfer and prior knowledge, with $r = 0.029$ and $p > 0.05$.

Mental efficiency score is obtained by using the formula:

$$E = \frac{M - P}{\sqrt{2}}.$$

The formula is introduced by Paas and van Merriënboer. M is the mean performance scores and P is the mean metal effort scores. For this study, the performance scores are the knowledge transfer test scores and mental effort score has been obtained by asking subjects to report the mental effort they used to understand the concept of sampling distribution by the help of animation or static visual displays (Pass, Tuovinen, Tabbers, & Gerven, 2003; Paas & Merriënboer, 1994). The rating scale is designed by Nadine Marcus, Martin Cooper, and John Sweller. The numerical values and associated labels range from *very easy* (1) to *very difficult* (7).

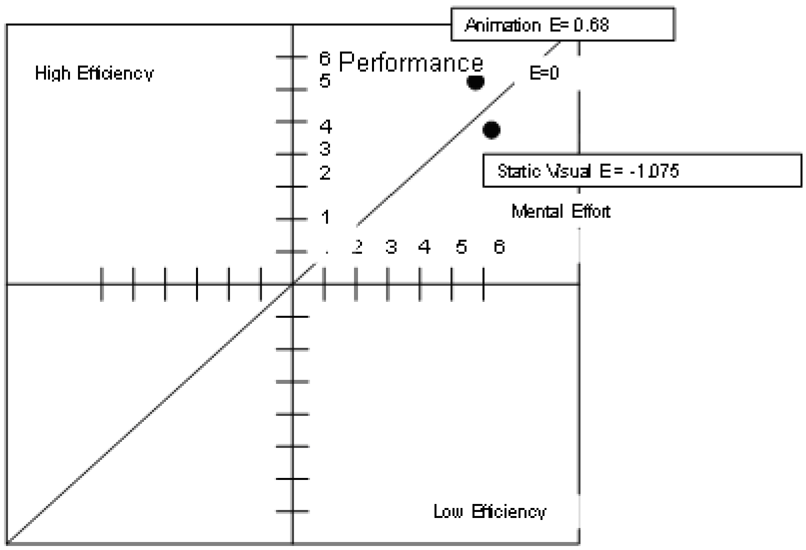
For static visual group, mean performance scores on knowledge transfer test is 4.34, and mean mental effort score is 5.86.

$$E = \frac{M - P}{\sqrt{2}} = \frac{4.34 - 5.86}{\sqrt{2}} = -1.075.$$

For animation display group, mean performance scores on knowledge transfer test is 6.37, and mean mental effort score is 5.41.

$$E = \frac{M - P}{\sqrt{2}} = \frac{6.37 - 5.41}{\sqrt{2}} = 0.68.$$

Figure 5. Mental efficiency as a function of knowledge transfer and mental effort. Animation group represents high efficiency and static visual group represents low efficiency.



Discussion

The data obtained from the present study indicated that animation group outperformed static visual group on knowledge transfer test ($p < 0.001$). The partial η^2 of 0.166 also suggested a strong relationship animation group has on knowledge transfer tests. This finding further supports previous researches conducted on the effect of animation and knowledge transfer (Mayer & Moreno, 2000; Mayer & Sims, 1994; Mayer & Anderson, 1992; Mayer, 1997; Craig, Gholson, & Driscoll, 2002).

A number of research studies demonstrated that animation produced no effects on learning (Ausman, Lin, Kidwai, Munyofu, Swain, & Dwyer, 2004; Rieber & Hannafin, 1988; Rieber, 1989; Rieber, Boyce, & Assad, 1990). This research study stated that animation group has mean score of 6.47 on knowledge transfer test, and static visual group has a mean score of 4.25. Animation group outperformed static visual group in 2.2 units on knowledge transfer test.

For students' prior knowledge, the present study indicated that there is low correlation between knowledge transfer test score and prior knowledge score. This finding suggests that students with high prior knowledge do not necessarily outperform students with low prior knowledge. This is incongruent with the previous research conducted by Schnotz and Rasch (2005) that for learners with prior knowledge, they needed external support from animation, though their research results proved that students with low prior knowledge performed better on test scores after learning with static pictures than animation.

For students' spatial orientation, the results showed that interaction for group and spatial orientation was not significant, but the interaction for group and visualization was significant. The relationship between the spatial orientation and knowledge transfer test was not significant with the spatial orientation accounting for 0.6% of variance of the knowledge transfer test for animation group. The relationship between visualization and knowledge transfer test was significant with the visualization accounting for about 4.8% of variance of the knowledge transfer test for animation group. The results suggested that visualization is correlated with animation learning which confirmed Mayer's research on students' spatial ability and their information processing in memory (Mayer, 1997).

For students' mental load, the mental efficiency score for animation group was 0.68, slightly above the E =0 line as shown in *Figure 5*, indicating that animation group is of high efficiency, with high performance score and comparatively low mental effort score. Static visual group had mental efficiency score -1.075, indicating low mental efficiency with low performance score but high mental effort score. The results confirmed that for learning involves spatial visualization; animation would help knowledge transfer and improve mental efficiency.

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A Quest for Instructional Design Competencies, Methods, and Tools to Support Effective Performance Assessment

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In today's fast-paced, transient, global economy, instructional technology (IT) professionals have no way to manage and track performance to industry competency standards. An IT professional's work life is constantly changing and new methods, tools, and technologies have an immediate impact on individual development. To effectively perform the functions of the instructional designer and developer roles, in any work environment, practitioners need the ability to measure and monitor their performance on industry defined competency standards. This would enable them to assess their strengths and weaknesses on core competency standards. IT professionals "have a responsibility to keep their skills current" (Rothwell & Kazanas, 2004, p. 386). Richey, Fields, Foxon, Roberts, Spannaus, and Spector (2001), claimed updating and improving one's knowledge, skills, and abilities is an important and essential competency. With the right measurement methods and tools professionals would be empowered to measure, score, and monitor their own performance on existing competency standards. This would also enable them to make effective decisions about their professional development and career planning activities. Similarly, employers and educational organizations would also be able to measure and monitor individual performance for recruitment, selection, placement, succession planning, training, development, and career counseling. A literature review was conducted to identify what competencies, methods, and tools are extant in the field to enable effective performance assessment of IT professionals. The author will discuss the research problem that led to the literature search, identify prior research studies, review the literature, and explain the solution. This literature review was conducted as apart of the author's dissertation research. In-depth coverage of the literature review and instrument development and validation results can be found in the dissertation.

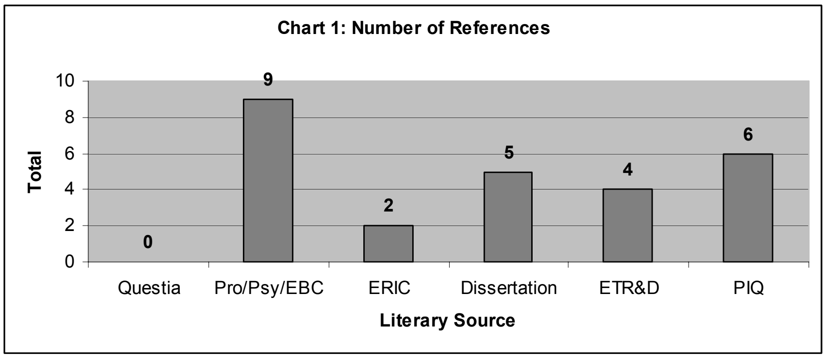
Problem Statement

Instructional designers and developers often fulfill multiple roles across IT domains (Seels & Richey, 2001). Business and industry perpetuates this practice requiring that professionals assume multiple roles throughout the training and development process. Carrying more than one role or wearing multiple hats at the same time has become common practice in the field. "When a situation calls for it, the professional slips out of one role and 'puts on' another… because a vast body of underlying skills and knowledge supports their execution." (Bernthal, Colteryahn, Davis, Naughton, Rothwell, & Wellins, 2004, p. xxiii). At the same time, "the [IT] profession…[has become] more complex and sophisticated…[and this] leads to specialization" (Richey et al., 2001, p. 107). This form of specialization is one of synergy and integration not segmentation and discord. Nor does it imply the notion of a widely renowned axiom jack of all trades. Rather, it suggests that those professionals who embrace the challenge and see themselves as integrated professionals with multiple competencies, talents, and skills across IT domains instead of specialized professionals in a single domain will possess a competitive advantage over those individuals who do not.

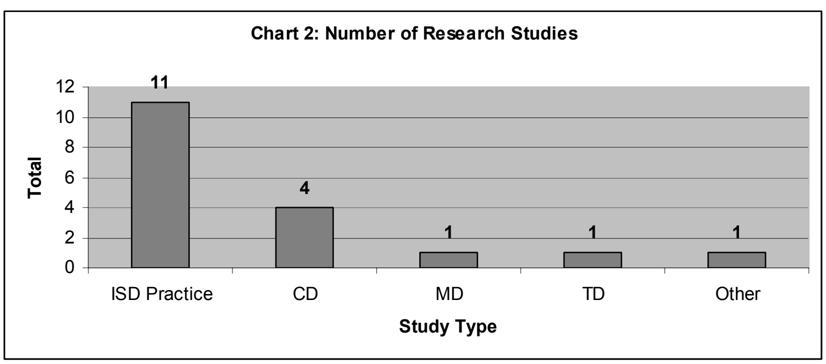
What is more, effective job performance can be mitigated when no means is available to accurately and objectively assess performance. To address this problem a literature review was conducted to identify prior research undertaken to answer the research question: what are the valid and reliable competencies, methods, and tools for assessing the preparation and performance of IT professionals? This literature review sought to synthesize into a cohesive whole the various theories, practices, methods, competency standards, and tools extant in the field to support the development and validation of the integrated performance assessment (IPA) methodology. By developing the IPA methodology, professionals, employers, and educational organizations will have an accurate and objective way to assess individual performance on known industry competency standards.

Literature Search

To answer the research question an extensive literature search was conducted using literary databases: PsychInfo, ERIC, Proquest, Questia, EBSCOHost, Proquest Dissertations and Theses, Internet search engines, books, Performance Improvement Quarterly (PIQ) Journal, and Educational Technology Research and Development (ETR&D) Journal. Several search terms and categories were identified. Instructional design was selected as the knowledge domain of interest with a focus on competencies, measurements, expertise, expert practices, processes, methodologies, models, performance assessments, and scale development. Results from Questia produced no studies, results from PsychInfo, Proquest, and EBSCOHost produced nine studies, results from ERIC produced two studies, results from Proquest Dissertations and Theses database produced five studies, results from ETR&D produced four studies, and results from PIQ produced six studies. Competency standards were retrieved from publications issued by the International Board of Standards for Training, Performance and Instruction (IBSTPI) and National Workforce Center for Emerging Technologies (NWCET). Table 1 shows the distribution of references by literary source. Of the 104 references identified for the entire study 40% were within the past ten years and 29% were within the past five years.



A total of 18 studies were identified within the general search term categories related to instructional design competency and the acquisition of expertise in instructional design. Table 2 illustrates the distribution of results obtained from the literature search by study type, which were deemed most critical and specific to the research question. Eleven qualitative studies related to ISD practice were conducted to identify and describe the differences between novice and expert instructional designers, practices employed during normal training and development activities, and skill classifications of competencies (see Larson & Lockee, 2004; Visscher-Voerman & Gustafson, 2004; Lui, Gibby, Quiros, & Demp, 2002; Reiser, 2001a; Reiser 2001b; Lui & Hempstreet, 1998; Perez & Emery, 1995; Winer & Vazquez-Abad, 1995; Wedman & Tessmer, 1993; Rowland, 1992, Gayeski, 1991; and Atichson, 1996). Four studies related to instructional design competency were conducted to define and establish knowledge domains, taxonomies, and standards (see NWCET, 2003; Richey et .al, 2001; Song, 1998; Atchison, 1996).



Competency Definition (CD), Model Development (MD), Tool Development (TD)

One study was conducted to determine the relationship between ISD models and multiple intelligences (Tracey & Richey, 2007). One study was conducted to develop a measurement instrument that could discriminate between masters and non-masters of instructional design (Stepp, 1995). Another study was conducted to develop and validate a multiple intelligences measurement instrument. Finally, one study was conducted to compare skill competencies with Bloom's taxonomy (Ven & Chuang, 2005). Of the studies found none were conducted to establish criterion and predictive validity and reliability of ISD competencies as a basis for assessing individual performance. In addition to these 18 studies, it was necessary to include seminal works from cognitive psychology, psychometrics, systems theory, and espoused theory (theory-in-use) to prepare the literature review.

Review of the Literature

Eighteen studies were conducted by various researchers and theorists in the field that met the search criteria. Many of these studies set the foundation of research in instructional design practice for such areas as competency definition, model development, tool development, and comparative analysis. The studies described in this section represent seminal works that support the recommended solution.

ISD Practice Studies

There was a wealth of literature and theory extant in the field that described and prescribed how to design instructional solutions, few studies looked at what IT professionals did in practice. One study conducted by Rowland (1990) showed that novice and expert designers differ in the way they carried out instructional design process steps and the types of solutions they devised. Another study conducted by Wedman and Tessmer (1993) sought to identify the frequency with which IT professionals used or omitted instructional design process steps in their projects. The study identified leading factors contributing to an IT professional's selection of certain design activities.

Winer and Vazquez-Abad (1995) replicated Wedman and Tessmer's 1993 study. The results of this study showed that individuals typically entered the field through education technology programs, on-the-job-training, personal or professional contacts, training seminars and workshops, and the International Society of Performance Improvement (ISPI). The homogeneity of the results also confirmed the validity of the ISD process used in Wedman and Tessmers's study. The results "allow us to make some general statements about what instructional designers do, and why they do not perform certain steps" (Winer & Vazquez-Abad, 1995, p. 63). A second and equally important benefit of this study indicated that selection of instructional strategies and media selection were the most important aspects of ISD, and these would undoubtedly have an impact on ISD processes in the future. This also suggested that IT professionals would "have to expand their focus [and skill repertoire] to include systemic influences and cultural constraints in the creation of learner-centered learning environments" (Winer & Vasquez-Abad, 1995, p. 65). In looking to the future, Winer and Vasquez-Abad (1995) suggested that these results make one wonder whether professionals would continue to use ISD models, and whether those models would continue to be appropriate tools to use to create learning and performance solutions.

A study conducted by Lui, Gibby, Quiros, and Demp (2002) showed how the field has diversified and grown in complexity, and new media design and development is a new reality for IT professionals. New trends and technologies have impelled IT professionals to acquire a multiple set of skills to cope with the increased demands in the industry. As the knowledge for building robust and innovative products and delivering rapid solutions continue, IT professionals have found themselves engulfed in more than one type of project. They must assume roles in areas previously reserved for more specialized professionals. Oftentimes, they may even find themselves wearing more than one hat or carrying more than one role (Bernthal et al., 2004; Larson & Lockee, 2004; Lui et al., 2002). In fact, "the term [instructional design and instructional developer] is less familiar outside the field. Instead, one hears job titles such as industrial designer, curriculum developer, [e-]learning specialist, instructional technologist, [subject matter expert, and] sometimes just project manager" (Lui et al., 2002, p. 2). This suggests that the title instructional designer or instructional developer may no longer be an appropriate title for every professional in the field; this is most noticeable due to the ever-changing new media tools, technologies, and delivery mediums. To be more consistent with emerging trends, it may be more appropriate to refer to IT professionals as *new media integrators*, especially since job titles, roles, responsibilities, and the work products they produce are a result of applying an interspersed skill set.

Competency Definition Studies

Atchison (1996) conducted a qualitative study to identify the competencies of expert IDs. Atchison's study helped to further classify, expand, and better define the 1986 IBSTPI standards (Atchison, 1996). The results from Atchison's study clearly explicated the differences between novice and expert practice. Song (1998) took the next step in helping to validate both the 1986 IBSTPI standards and Atchison's expert competencies. Song's study sought to determine whether IT professionals in the field could further classify the complexities of the competencies (Richey et al., 2001; Song, 1998). Song (1998) used a descriptive research method and developed a survey instrument using both the 1986 IBSTPI standards and Atchison's expert competencies. She was able to further classify the competencies at the novice, intermediate, and expert levels.

IBSTPI used the findings from the Atchison and Song studies to develop a newer and broader set of ISD competencies – the 2000 IBSTPI standards. These newer competency standards reflect current practices in the field. IBSTPI conducted a study to validate the new competencies and performance statements for use in the profession (Richey et al., 2001). This validation study used two survey instruments: one to measure designer perception of competency criticality and the other to determine expertise levels required on-the-job to demonstrate each skill (Richey et al., 2001). IBSTPI also created two skill classifications for the standards: essential and advanced.

While Atchison (1996) was quantifying the ISD exemplary competencies at the expert level, the NWCET identified eight information technology skill standards (NWCET, 2003). Around the same time that Song (1998) was conducting her study, NWCET also conducted nationwide research to validate the information technology skill standards. NWCET identified and updated the skill standards with new and emerging workforce job roles, technical knowledge, and related foundational skills (NWCET, 2003). Three career clusters comprised of 18 competencies were identified for the instructional design role and several key job roles required of IT professionals were also included in job classifications for information technology professionals.

These four studies were conducted to identify, classify, and define existing skill standards. The Atchison study was a qualitative study to further expand known ISD competency standards at the expert level. The study focused heavily on clearly explicating a dividing line between novice and expert practice. Similarly, the Song (1998) study sought to further establish differences in expertise at three different skill levels: novice, intermediate, and expert. The 2000 IBSTPI study established a new set of ISD competencies, which validated the content of each competency and performance statement and ultimately classified each competency as either essential or advanced. The 2003 NWCET standards further expanded ISD knowledge domains and competencies within the information technology field. None of the four studies established the criterion and predictive validity or reliability of the ISD competency standards. Although the independent research efforts of IBSTPI and NWCET creates a professional bridge between instructional technology and information technology fields.

Model Development Studies

One study was conducted to develop and validate a multiple intelligences (MI) design model (Tracey & Richey, 2007; Tracey, 2001). The original study was completed as dissertation research and published in the ETR&D journal. This research sought to integrate the theoretical foundations of instructional design with multiple intelligences into one model that can be used by instructional designers to guide the creation and development of instructional materials to enable learners to construct meaningful learning in multiple ways (Tracey & Richey, 2007). The study also had the added goal to establish the validity of the MI model using internal validity procedures (Tracey & Richey, 2007). The results from this study confirmed the validity of a combined model that uses the tenets of instructional design and multiple intelligences to guide the design and construction of learning.

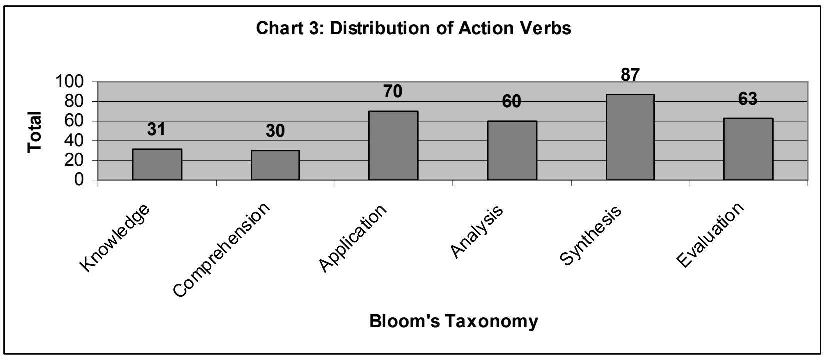
Tool Development Studies

Stepp (1990) conducted research to validate a measurement instrument to discriminate between masters and non-masters of instructional design using the IBSTPI standards as a framework. Stepp's final paper and pencil test instrument consisted of 50 test items for the original item bank. Content review was conducted to establish validity with two subject matter experts and the final item bank consisted of 35 items. This instrument was administered to 257 subjects. Eighty-three subjects participated in item analysis and the remaining 184 participated in instrument validation, which resulted in a Pearson point-biserial coefficient of .695 for validity and a Cronbach alpha of .746 for reliability (Stepp, 1990). Discriminate analysis of the instrument showed that all but 4 questions were successful discriminating between masters and non-masters. Omission of these four questions increased the phi coefficient to .758 and the Cronbach alpha coefficient increased to .762 (Stepp, 1990).

Several conclusions and recommendations were made to further this research effort and improve upon the approach. First, comments made by many masters during the study, suggested that Stepp's instrument should be used more as a research tool rather than a certification tool. Although Stepp used a norm-referenced approach in his overall design, it was limited by his extrapolation and omission of certain competencies that represent higher ordered thinking, interaction, and complexity. The decision was made to focus on developing a norm-referenced instrument, which would not require all competencies to distinguish between masters and non-masters. This was due, in part, to the fact that Song believed that certain standard competencies was immeasurable through structured and objective test methods (Stepp, 1990; Reynolds et al., 2006; Schwurith et al., 2005). Performance assessment methods such as direct observations and portfolios are alternative means that can be used to ascertain higher levels of skill capability. Reynolds et al. (2006) posited, "performance assessments require test takers to complete a process or produce a product in a context that closely resembles real-life situations" (p. 239). Second, further research is required to reinvigorate and expand upon the efforts made in Stepp's study. An extended research study should focus on extending Stepp's study to look at the entire set of IBSTPI and NWCET standards using the self-rater, criterion-referenced, and performance assessment methods.

Other Comparative Studies

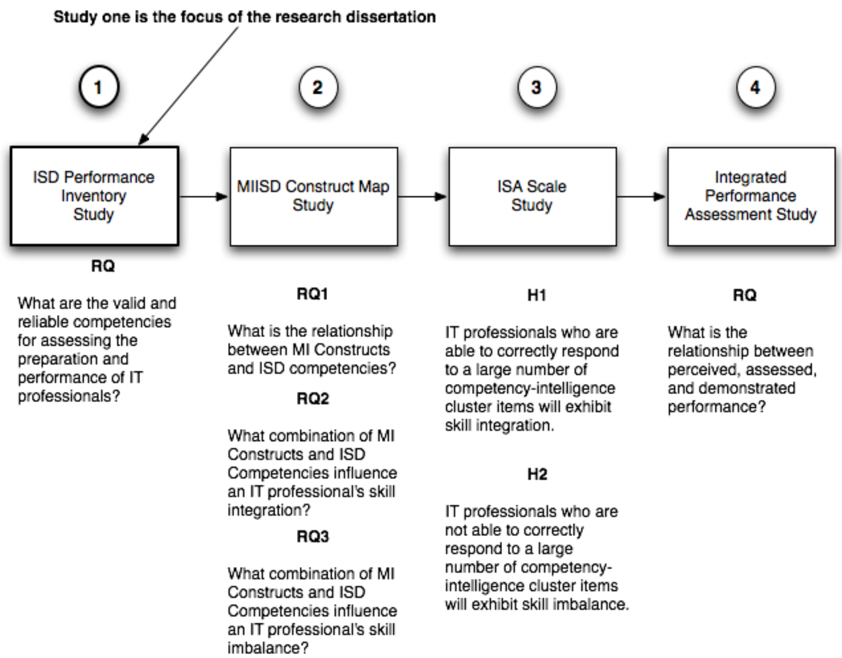
A study conducted by Ven and Chuang (2005) was completed to determine the classification of action verbs for competency standards in the information science profession in three different countries: America, Australia, and Taiwan. An action verb lexicon was developed to correctly classify action verbs using Bloom's taxonomy for the cognitive domain. A total of 341 action verbs were identified and categorized. Chart 3 illustrates the distribution of action verbs according to Bloom's Taxonomy (Ven & Chuang, 2005).



Recommendations

This literature review was conducted to identify prior research undertaken to answer the research question: what are the valid and reliable competencies, methods, and tools for assessing the preparation and performance of IT professionals? The search also sought to verify and validate the need to develop and validate the IPA research methodology. The IPA research methodology (see Figure 1) consists of four studies: the ISD Performance Inventory study, Multiple Intelligences ISD (MIISD) Construct Map study, Integrated Skills Assessment (ISA) study, and IPA study.

Figure 1: IPA Research Methodology



ISD Performance Inventory Study

This first study will 1) establish a framework for scoring IT professionals across all IT domains and related disciplines on known competency standards, 2) better classify and explicate ISD competencies to reflect stages of growth and development using the Dreyfus model (Dreyfus & Dreyfus, 1995), and 3) expand the validity and reliability of ISD competency standards through quantitative analysis. IBSTPI and NWCET sought to validate similar but discrete competency standards for IT professionals. IBSTPI developed and validated a set of 23 competencies across four separate knowledge domains (Richey et al., 2001). NWCET developed and validated a set of 18 competencies across three career clusters (NWCET, 2003). The ISD Performance Inventory study will be conducted to develop a valid measurement instrument based on the combined IBSTPI and NWCET standards. The domains, competencies, and performance statements identified and refined in previous studies (see NWCET, 2003; Richey et al., 2001; Song, 1998; Atchison, 1996) will serve as a framework that the researcher used to create the initial item pool for the ISD Performance Inventory. Additionally, the Dreyfus model consists of five stages: novice, advanced beginner, competent, proficient, and expert. The researcher used the Dreyfus model as the rating scale for each item in the initial item pool for the instrument. Finally, development of the final ISD Performance Inventory depends on establishing the validity and reliability of the instrument through quantitative analysis. To accomplish the goals of this study the researcher will use a four-step scale development and validation process. This process was proven to be the best empirical method for developing and validating measurements (Viswanathan, 2005; DeVellis, 2003; Netemeyer, Bearden & Sharma, 2003).

MIISD Construct Map Study

Study two will be a cross-validation of ISD competencies and MI constructs to identify competency-intelligence relationships between these two mutually exclusive components. The identified competency-intelligence clusters will describe how these constructs influence skill integration and skill imbalance. This study seeks to answer the following: What is the relationship between MI constructs and ISD competencies? What combination of MI constructs and ISD competencies influence an IT professional's skill integration? What combination of MI constructs and ISD competencies influence an IT professional's skill imbalance? To answer these questions it is necessary to first establish the relationship between intelligence and competency. The researcher will obtain intelligence and competency scores using two separate measurements. The Multiple Intelligence Developmental Assessment Scales (MIDAS) and the ISD Performance inventory will serve as measurement instruments. The MIDAS is a 106-item report completed by an individual or a knowledgeable informant (Shearer, 1996). The MIDAS measures a person's intellectual capabilities on all MI constructs (Shearer, 1996). Similarly, the purpose of the ISD Performance inventory is to measure a person's skill capabilities on ISD competencies. Analysis of the data from both measures will help to determine the correct classifications and descriptions of competency-intelligence clusters. Once the number of competency-intelligence clusters has been identified, the information may be used to describe a person's skill imbalance or skill integration.

ISA Scale Study

Study three will be to develop and validate the ISA scale. The ISA scale is a criterion-referenced measurement based on the competency standards and competency-intelligence clusters defined in studies 1 and 2. This study seeks to test the following hypotheses: IT professionals who are able to correctly respond to a large number of competency-intelligence items will exhibit skill integration. IT professionals who are not able to correctly respond to a large number of competency-intelligence items will exhibit skill imbalance. To test these hypotheses it is necessary to overcome the subjective limitations of self-reporting measures and 360-degree reviews. A better and more objective performance assessment method is attainable through criterion-referenced testing. A criterion-referenced test measures what a person knows or can do compared to what he or she must be able to know or do in order to perform a job or task successfully (Reynolds et al., 2006; Swezey, 1981). Criterion-referenced tests are designed to measure a person's skill capabilities against known performance standards. In the case of the IT professional these known performance standards include the 2000 IBSTPI and 2003 NWCET standards. Stepp (1990) developed a measure that could discriminate between IT professionals. Stepp's final instrument was norm-referenced and consisted of 50 test items for the original item bank in paper and pencil format. Further research is required to reinvigorate and expand upon the efforts made by Stepp. An extended research study should 1) focus on replicating Stepp's study, 2) focus on a criterion-referenced approach to look at the entire set of IBSTPI and NWCET standards, and 3) broaden the scope of subject groups used for the study. The ISA study offers an alternative method to extend past research efforts.

IPA Study

Study four will be to answer the research question: What is the relationship between perceived, assessed, and demonstrated performance? This study will consist of three parts and employs a concurrent triangulation strategy (mixed methodology) using the case method. "Concurrent procedures, …[in mixed-methods studies,] collect both forms of data at the same time during the study and then integrates the information in the interpretation of the overall results" (Creswell, 2003, p. 16). In this case, a combined quantitative and qualitative approach mitigates the limitations of a single approach while canceling out the biases of either approach (Creswell, 2003). Part one of this study will ask participants to rate themselves on the ISD Performance inventory. Part two will ask participants to complete the ISA scale. Part three will ask participants to complete an ISD project to measure their skill capabilities through product development, observations, and interviews. The data from these three measures provide a snapshot of an IT professional's skill capabilities, and may be used to develop a skill capabilities profile for an individual.

Theoretical Framework

The entire IPA research methodology focuses on four theoretical areas: multiple intelligence theory, systems theory, psychometric theory, and espoused theory (theory-in-use). Multiple intelligence theory describes the connection between intelligence and competency. There is a neurological connection between competence and intelligence and identification of competency-intelligence clusters will provide a basis for measuring both constructs (Connell, Sheridan, & Gardner, 2003). According to Fodor (1983):

> The mental causation of behavior typically involves the simultaneous activity of a variety of distinct psychological mechanisms, [and] the best research strategy would seem to be divide and conquer: first study the intrinsic characteristics of each of the presumed faculties, then study the ways in which [those faculties] interact. (p. 1)

Systems theory provides a theoretical explanation of the interactions between competence, intelligence, and environmental factors. This notion is an outgrowth of Cartesian theory, which explicates that cognition, is directly linked to human behavior and consists of modular and integrative faculties (Connell et al., 2003; Fodor, 2000; Fodor, 1983).

Psychometric theory describes the relationship between variables to determine which combination of competency-intelligence clusters describes and influences skill integration and skill imbalance. Connell et al. (2003, p.136) claimed “it is possible to parse the space of human cognitive capacities in many ways.” The studies outlined here represent one possible method for parsing intelligence and competence in order to describe the skill capabilities of IT professionals. Skill integration and skill imbalance is central to the entire IPA research methodology. As an IT professional uses one or more of his or her intellectual faculties (MI constructs), this builds behavioral skill capacities in multiple content domains or disciplines (ISD competencies), which can lead to either skill imbalance or skill integration. Skill imbalance is the natural tendency to overuse or concentrate on one or more closely related competency-intelligence clusters, which causes skill-lopsidedness and inflexibility because certain competency-intelligence clusters are over or under used. This behavior leads to skill imbalance because it is easy for individuals to want to exercise or improve their skills in those areas that they enjoy or have a natural affinity towards. Skill integration, on the contrary, is the ability to combine and use a mixture or blend of MI constructs and ISD competencies. This behavior results in versatility and flexibility. However, it is difficult to accomplish skill integration because it requires making a conscious effort to use all one’s skill capabilities, which may be dormant and requires development, under developed, or under used due to lack of practice.

Espoused theory helps to explain perceived, assessed, and demonstrated performance. What someone thinks he or she is capable of doing, how others know that he or she is capable, and how that capability may be demonstrated are not always in alignment. Schön (1983) suggested, “every competent practitioner can recognize phenomena – families of symptoms associated with a particular…[issue, problem, or situation] – for which he [or she] cannot give a reasonably accurate or complete description [but recognizes that he or she has some level of competency or ability poised ready to solve it]” (p. 49).

Each theory is fundamental to the IPA research methodology. First, the ISD Performance inventory study uses espoused theory and psychometric theory as the theoretical framework for data collection and analysis. Second, the MIISD construct map study and ISA scale study uses multiple intelligence theory, systems theory, and psychometric theory as the theoretical framework for data collection and analysis. Finally, the IPA scale study uses all four theories. The goal is to produce an integrated performance assessment methodology to assist organizations and professionals with selection, placement, career planning, and professional development activities.

Conclusion

Before energy could be expended to create methods and tools to enable practitioners to measure and track individual performance against industry competency standards a literature review was conducted to determine what competencies, methods, and tools were extant in the field. While there are clearly defined competency standards and several types of methods available to guide performance measurements, there still remain no tools readily available that practitioners can use to measure performance in current, new, or emerging competency domains nor is there an integrated performance assessment methodology available to enable holistic measurements of individuals from multiple perspectives across all competency domains. For example, IT professionals are the architects of multiple types of instructional solutions and often develop and construct learning experiences designed to cultivate and transfer knowledge (Tracey & Richey, 2007; Tracey, 2001). The skills IT professionals need to maintain multiple roles also require them to possess competencies in more than one content domain. “Playing [with multiple] roles is analogous to maintaining a collection of hats – when the situation calls for it, the professional slips out of one role and ‘puts on’ another” (Bernthal et al., 2004, p. xxiii). IT professionals must produce learning experiences and create environments that capitalize on the learning styles of learners while providing opportunities for learners to develop their multiple intelligences. Similarly, in order to be effective in maintaining multiple roles, IT professionals must also develop the same multiple intelligences that they seek to impart to the learner.

As noted earlier, previous studies of ISD competencies have not looked at or explored ways in which IT professionals could be measured on ISD competency standards (see NWCET, 2003; Richey et al., 2001; Atchison, 1990; Song, 1998). Second, there has been only one attempt to develop a measurement to assist IT professionals with assessing their skills on ISD competency standards (see Stepp, 1990). Finally, seminal studies undertaken to describe ISD practice prior to studies to define and validate ISD competencies were primarily qualitative. Ultimately, the IPA research methodology stands in stark contrast to these previous qualitative studies because the long-term goal of this research methodology is to establish an objective, valid, and reliable systemic measurement process to assist IT professionals and organizations with assessing skill capabilities using quantitative and qualitative methods. The ISD Performance Inventory study, is the first study implemented, and has the short-term goal to establish a valid and reliable measurement instrument to assess the skill capabilities of IT professionals. The results from this study will lead to studies two, three, and four. A unique skill capabilities profile outlining a professional's strengths and weaknesses provides guidance in skill areas where he or she may need improvement. Professionals could then use their individual profiles as a way to self-regulate their performance as a part of career and professional development activities. Employers could use the profile to make more effective career planning decisions regarding existing employees and make better hiring decisions regarding new job candidates. Educational organizations could also use the profile to provide direction and guidance about training and academic program offerings.

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Changing the Kaleidoscope for End-of-Course Surveys

Michael Chronister and David Pedersen

End-of-course surveys are an important and often controversial part of the Kaleidoscope of academic performance assessment. For that reason changes to the process at Embry Riddle Aeronautical University were approached cautiously. After years of discussion, an initiative was begun to migrate from paper-based end-of-course surveys to online surveys. Choosing the appropriate vendor was a challenging, but crucial step in the implementation process. Implementation began with a small pilot study that compared paper and online results. Based on the success of the pilot study, full implementation was initiated. At that point several challenges emerged that required adaptation and resulted in some lessons learned that should be instructive to others considering the move to online surveys.

The Initial Condition

Embry-Riddle Aeronautical University is a multi-campus university with two traditional residential campuses, 130 teaching centers world wide, and a distance learning program. End-of-course evaluations were conducted differently at each campus. Most were conducted using a traditional paper-based instrument, but questions varied from campus to campus, and the distance learning program used a home-grown database to collect course evaluation responses.

After years of discussion, initiatives from all three campuses intersected in the summer of 2004 with independent requests from each campus for the Information Technology department to implement online surveys. One campus was in a beta project to develop a new open source application for online surveys. Another campus was focused on the broader question of evaluating faculty performance using a variety of instruments including online surveys. The third campus had a faculty senate sub-committee looking at online survey vendors. The efforts of the three campuses finally merged with a meeting of campus representatives convened by the Provost in the spring of 2005 that resulted in a university-wide selection initiative.

The Selection Process

Following the 2005 summer break, a committee was appointed by the provost's office consisting of campus representatives from the faculty, teaching and learning centers, information technology, institutional research, and the assistant provost. During the summer months prior to establishing the committee, the educational technologist who had been working with the three campuses conducted a review of the five vendors under consideration regarding critical elements of the online survey process. A report was created that compared the following requirements and also included information concerning each company's experience, customer base, and any unique characteristics.

- Flexible Survey Authoring - The ability to create multi-tiered surveys that can include questions from the perspective of the instructor, the department, the college, the campus, and the university.
- Controlled Distribution - The ability to distribute and submit surveys via the university portal. Students would be authenticated to complete surveys only for the courses in which they are enrolled. Authentication would require an interface with the student data system to provide user authentication and course enrollment data.
- Data Collection and Analysis – The ability to track responses and promote participation. Responses are collated and analyzed appropriately for the instructor, department, college, campus, and university levels. Data is available for further analysis.
- Tailored Reporting - Data are reported in appropriate information formats for varied users. Instructors would receive information relevant only to their courses, while departments, colleges, and campuses would receive summary data appropriate to their needs.

The overall result of the reviews indicated that online surveying is a relatively new endeavor, all of the solutions lacked robustness of features, and vendors were in the process of improving their offerings by adding functionality or creating new solutions.

Using the report, the committee asked three vendors to provide demonstrations of their products and narrowed the field to a single selection. At that point, the Institutional Research Department requested that consideration be given to the vendor they were currently using to conduct general surveys. Because that department would be managing course surveys, and their vendor had just announced an integration component for the university's course management system, a demonstration of the product was arranged. Results indicated that the extensive customization needed to make their solution viable would be untimely and too costly.

Implementation of the System

The selection committee's consensus recommendation was forwarded to the administration for approval in April 2006. Due to funding and acceptance considerations, it was decided to conduct a pilot test of the system for the fall term. The pilot was conducted with 21 instructors who taught two sections of the same course. One section submitted surveys online; the other section submitted paper-based surveys in the classroom. The return rates for the online administration were about 30% lower than for class room administration. However, the online respondents provided 15% more comments than the paper-based respondents. Comparison of the paper-based vs. online results found statistical differences in only 3 of the 11 items at just one of the campuses with online results being slightly less positive. While there were some concerns with return rates and slightly less positive responses, the committee recommended proceeding with full implementation.

Full implementation of the online course evaluation system began in spring 2007. ERAU faced challenges as would be expected with the rollout of any new process or system. The majority of the problems encountered in the implementation of the online evaluation system can be traced to three main sources: inconsistencies in the data from the student information system, problems with the vendor, and ineffective internal communication.

Data in the Student Information System:

As the distribution of the evaluations and the aggregation of the results are based on course enrollments, the most important consideration in the implementation of an online course evaluation system is the accuracy of the data in the student information system. Embry-Riddle IT created a system that captures data from the SIS and automatically formats it to be uploaded into the online evaluation system according the vendor's specifications. IR and IT met with individuals that were most familiar with the student information system and were assured that the data we planned to use was accurate and current. This proved true in better than 99% of the cases; however, some inconsistencies were found in key fields such as faculty department, course end date, and user ID. These rare inconsistencies caused errors in the automated process and lead to a great deal of manual manipulation of the data.

Lesson Learned: A more thorough accounting of all data in all key fields as well as additional flexibility in the automated process would have ensured an easier integration of the online evaluation system.

Verify the Vendor's Work:

The vendor created a customized report database to meet the specific reporting requirements of Embry-Riddle. However, the database was not delivered at the time of the pilot test. As there would be several months between the pilot test and full implementation of the system, ERAU accepted on good faith the vendor's promise that the report tool would be made available for the spring 2007 implementation and agreed to a contract. However, the report database was delayed beyond the implementation and reports were not available to instructors or administrators until several months after the initial evaluations were completed. This delay caused frustration and dissatisfaction among the faculty.

One of the key requirements of the system was that users would be authenticated and have access to the online evaluations via the university portal. This was accomplished using token authentication between ERAU and the vendor. ERAU setup to deliver the token as described in the Software Requirements Specifications provided by the vendor. Unfortunately, in some instances the vendor did not follow their own specifications. As a result, the authentication worked during business hours, but for several hours each night the tokens did not match, leaving the evaluations inaccessible. This periodic lack of availability was obviously problematic for our students and faculty in other time zones and hurt the response rates and the general credibility of the system. ERAU IT implemented a testing protocol to automatically test the authentication system periodically and log any failures. This facilitated diagnosis of the problem and will ensure that the administrators will be aware of any future outages. Implementation of such a testing procedure at the outset of the system would have picked up on the discrepancy in the documentation.

Lesson Learned: Verification of all of the deliverables and establishment of protocols to test the vendor's work would have ensured that the system was fully functional prior to full implementation.

Communication:

Effective communication within any large organization is difficult, and with its international teaching sites and distance learning programs ERAU is no exception. In addition as the online evaluation system required a completely new process, a great deal of information had to be made available to a large number of people. Details regarding when the evaluation would be available, how users would be notified, instructions for students to access the evaluations, who has the ability to view the results, and how to access the reports needed to be communicated. The administrators of the online evaluation system notified the university community of the new system and provided training materials for users well in advance of the implementation. In addition, the section of the university policy and procedure manual related to course evaluations was revised. All such communications were conducted by email as it is the official outlet for university announcements. However, it became apparent email is a less than reliable form of communication. Email is easily blocked, lost, deleted or never delivered. In addition, some students, faculty, and staff do not check their university email accounts, and if they do, they do not thoroughly read long, detailed messages or updated policy manuals especially if some of the information does not apply directly to them. The difficulty in providing each user with the information they needed and nothing more created confusion and dissatisfaction with the online evaluation process.

Lesson Learned: The administrators of the online evaluation system have created an informational webpage with all of the training materials and policies available to the users. Instead of pushing the entirety of the information to all of the users, they can direct the users to this clearinghouse where they can find the information and support they need.

Reflection on the pilot test:

The pilot test was primarily conducted in order to determine if the online evaluations would achieve acceptable response rates in order to reassure the faculty that the change in the method of evaluation would not negatively impact the results. The pilot proved quite valuable in this effort. However, the small number of courses chosen for the pilot did not provide a sufficiently large sample to effectively evaluate the system for errors and inconsistencies. Many of the difficulties noted above would have been caught by a larger pilot test, allowing them to be addressed prior to full implementation.

Overall Lessons Learned

1. Including appropriate representation from each campus in the selection process was critical.
2. Centralizing the selection process from the Provost's office at the outset would have cut the selection time considerably.
3. Coordinating the selection process with the academic calendar would have made the process more efficient.
4. The pilot provided valuable supporting evidence for the viability of full implementation, but it failed to reveal some of the problems encountered in full implementation. Increasing the size of the pilot would have been helpful.
5. Technical solutions must function properly. Any failure causes dissatisfaction for the whole application. It is important to adequately test all systems prior to full-scale implementation.
6. Effective communications to constituents is critical. Multiple methods should be used to disseminate information.

Summary

Changes to the faculty evaluation process are highly charged events. Migrating end-of-course surveys from paper to online was a courageous first step in a broader initiative of implementing technology to make assessment of academic performance more efficient and effective. It is anticipated that future endeavors will include electronic portfolios for faculty performance evaluation and program assessment, and discussions have begun on implementing an institutional assessment package that is now part of the university's course management system. Experience gained from implementing online surveys should inform the process of implementing additional technologies that will continue to change the assessment Kaleidoscope at Embry-Riddle Aeronautical University.

Managing Knowledge Work

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This article describes the *iLearning* framework for managing knowledge work in organizations. This framework was initially used to successfully build a knowledge dissemination system for the laboratories and facilities that are under the direction of the United States Department of Energy (DOE) (Salisbury & Plass, 2001). The follow-on work to this effort was the development of a collaboration application that fed the dissemination system for the DOE laboratories and facilities. The resulting system managed the life cycle (creation, preservation, dissemination and application) of knowledge for the DOE laboratories and facilities (Salisbury, 2003). Recent work has focused on extending the theoretical foundation of the framework to improve collaboration and in methods to identify performance objectives of knowledge work for reusing and repurposing that work. In the next section, the life cycle of knowledge in an organization is discussed. Next, the theoretical foundation for the *iLearning* framework is described. Afterwards, Technologies used to manage the life cycle of knowledge in an organization are highlighted. Finally, the other aspects of the framework -- Work Processes, Learning Processes, and Methodologies -- that support Technologies for integrating knowledge into a collaborative work environment in an organization are discussed.

The Life Cycle of Knowledge in an Organization

Successful organizations have learned to manage the ongoing life cycle of knowledge – its creation, preservation, dissemination, and application. The first phase, creation of new knowledge, takes place when members in the organization solve a new unique problem, or when they solve smaller parts of a larger problem such as the ones generated by an ongoing project. The next phase is the preservation of this newly created knowledge. This includes recording the description of the problem as well as its new solution. This phase feeds the next one, the dissemination and application of this new knowledge. The dissemination and application phase involves sharing this new knowledge with the other members of the organization. It also includes sharing the solutions with the stakeholders affected by the problems that were solved. Disseminated knowledge then becomes an input for solving new problems in the next knowledge creation phase. An organization's ability to solve problems increases with the utilization of this disseminated knowledge. In this way, each knowledge life cycle phase provides input for the next phrase -- creating an ongoing cycle. Since this cycle continues to build upon itself, it becomes a *knowledge spiral* in the organization as described by Nonaka and Takeuchi (1995).

While the growth and sharing of knowledge is recognized as one of the most important elements in becoming a learning organization (Easterby-Smith, 1997; Marsick & Watkins, 1994; Senge, 1990), what has been missing, according to many researchers and practitioners in the field, is the development of a theoretical foundation for describing how people learn and perform in an organization (Raybould, 1995; Salisbury, 2000). This theoretical foundation is needed by today's organizations to avoid the development of technological solutions that do not support their entire life cycle of knowledge (Plass & Salisbury, 2002). To address this situation, a theoretical foundation for integrating learning into collaborative work was developed. It describes how learning can take place with one individual, be preserved, and transferred to other individuals in an organizational setting (Salisbury & Plass, 2001; Salisbury, 2003).

Theoretical Foundation for *iLearning*

To represent the complexity of organizational knowledge, a revision of Bloom's Taxonomy (Bloom, 1956) developed by Anderson, Krathwohl, Airasian, Cruikshank, Mayer, Pintrich, Raths & Wittrock (1998) was used to provide the basis for extending the description of knowledge utilized within the *iLearning* framework. One of the major differences in the revised taxonomy by Anderson et. al. (1998) is the identification of knowledge as a separate dimension that describes it as factual, conceptual, procedural, and metacognitive. Another major difference is that Anderson and colleagues recast Bloom's other categories into a "process dimension" which describes the learner's cognitive processes when processing knowledge of that category. These process dimension categories were also renamed from Bloom's original "knowledge, comprehension, application, analysis, synthesis, and evaluation" to "remember, understand, apply, analyze, evaluate, and create." Note that Anderson and colleagues place "create" as the highest level of cognition; it describes individuals putting elements together to form a novel coherent whole or make an original product.

Anderson et al. (1998) describe factual knowledge as terminology, specific details, and elements. Conceptual knowledge relates to theories, models, principles, and generalizations. Procedural knowledge includes skills, algorithms, techniques, and other methods that are specific to a product or process. Metacognitive knowledge was added by Anderson and colleagues to Bloom's Taxonomy. It is "knowledge about knowledge" and involves general strategies for learning, thinking, and problem solving. Metacognitive knowledge also includes knowledge concerning the appropriate contexts and conditions for the use of the strategies themselves. Additionally, it includes the “heuristics” or “rules of thumb” that experts use to solve problems.

At the individual level, the theoretical foundation has elements of Situated Cognition as described by Brown, Collins & Duguid (1989). The theoretical foundation supports learning in the context of the work at the moment – creating an “authentic context” for learning. Knowledge workers can access knowledge – and other people -- to learn how to construct solutions to pressing organizational problems in a just-in-time manner. Furthermore, the theoretical foundation supports Situation Cognition for learners with differing cognitive needs by providing different types of knowledge as defined by Anderson and his colleagues (1998) in their revision to Bloom's Taxonomy (factual, conceptual, procedural, and metacognitive). As a result, the theoretical foundation supports work and learning to “live in the same space, “occur at the same time,” and become interdependent. As a result, learning is situated in the authentic task of organizational work and takes place during that work.

At the team level, the theoretical foundation is an extension of the theory of distributed cognition (see Salomon, 1996, for an overview of distributed cognition). One of the best documented examples of distribution cognition in a work environment is by Edwin Hutchins in his book “Cognition in the Wild” (Hutchins, 1996). Hutchins studied how a crew collaborated to operate a large ship at sea. According to his description of the theory of distributed cognition, cognition is distributed across individuals. That is, no one individual has complete knowledge as to how to accomplish a complex task such as operating a large ship. Hutchins also describes that cognition is distributed across the artifacts of an organization’s work. On the ship that means the instruments provide critical decision-making information to the crew members. And, according to the theory of distributed cognition, cognition is in the history of those artifacts. On the ship, the previous version of an instrument gives a context for the present version of that instrument. In an office environment, artifacts are the knowledge products of the organization. These are the “intermediate products” of a larger process and are such things as design documents and quality plans. Another set of artifacts are the knowledge assets that document the organization’s processes, instruction, work examples, and expert advice that are used as resources by the members of the organization to make the knowledge products. In the theoretical foundation, the theory of distributed cognition is extended to involve different types of knowledge as defined by Anderson and his colleagues (1998) in their revision to Bloom's Taxonomy (factual, conceptual, procedural, and metacognitive); these different types of knowledge are present in the distribution of cognition across individuals, their artifacts, and the history of their artifacts.

At the organizational level, the theoretical foundation is an extension of Nonaka and Takeuchi’s (1995) description of creating a knowledge spiral in an organization. In Nonaka and Takeuchi’s knowledge creation process, transferring knowledge from one organizational member to another begins by the first member converting tacit knowledge (intuitions, unarticulated mental models and embodied technical skills) into explicit knowledge (a meaningful set of information articulated in clear language including numbers or diagrams). This explicit knowledge can then be passed on to another member of the organization -- who must convert it into tacit knowledge (internalization) before he or she may use it. Again, the theoretical foundation extends this description of knowledge creation by identifying the different categories of knowledge as defined by Anderson and his colleagues (1998) -- factual, conceptual, procedural, and metacognitive -- that are involved in the knowledge creation and transfer process.

Technologies

In the following example, disseminating and applying knowledge begins with an engineer that needs to make a quality plan for a new product. The engineer goes to the system (perhaps, from a cell phone), clicks on the area of Design, then clicks on the area of "Detailed (Design)," and drills down to the area of "Quality Plan." There the engineer finds all the materials that he or she will need to develop a Quality Plan. There will be documents describing what needs to be addressed in the Quality Plan. There will be instruction available on the general principles and techniques behind a Quality Plan. The instruction addresses the "why" part — that is, why do we need a quality plan? There are also examples available of successful quality plans. They illustrate how someone applied the general principles of developing Quality Plan to a specific project. Finally, there is expert advice available that provides some direction as to when to use one approach over another when developing a Quality Plan.

But that's not all the engineer would find at that Quality Plan area in the system. The engineer would also find links to the people that are responsible for the content of the area. There is contact information for the creators of the documents, instruction, examples, and expert advice. In contacting these content providers directly, the engineer has the opportunity to understand the subtleties of the content and its application to specific projects. Note that with these resources – materials and an opportunity for an exchange with the people who created them – the engineer can learn what is needed to get the job done. In this case, it's the creation of a Quality Plan. With adequate materials and the help of others, the engineer learns – only what is needed, in a "just in time" manner -- to create the Quality Plan. And it could be done with a portable device such as a cell phone. This is learning situated in the context of an authentic task – the pressing work of the moment. It describes the essence of Situated Cognition as described by Brown, Collins, and Duguid (1989).

However, when the engineer creates the Quality Plan – it is just the first step in completing a finished Quality Plan in a collaborative work environment. The next step is a review step – followed by an approval step. Note that all the assets that were available to the engineer to create the Quality Plan – materials and an opportunity for an exchange with the people who created them – are available to the other people involved in the review and approval steps. They, along with the engineer that created the Quality Plan, have integrated learning as they work together in a collaborative work environment.

Integrating Learning into Collaborative Work

This example described above is the result of integrating learning into a collaborative work environment for an organization. However, what we have seen is simply the technology that serves up the information. Technology-based solutions leave us here – wondering how the information gets into the system – and more importantly, how is it updated and maintained. It's quickly apparent that the technology is simply the "tip of the iceberg" – a byproduct of integrating learning into collaborative work -- that has provided this information. As Figure 1 shows, this article discusses the foundations, processes, and methodologies needed to support the technologies for integrating learning into a collaborative work environment.

Take, for example, the business process for a manufacturing company with the two main steps of "Design" and "Build" for the manufacturing process. The Design step contains two sub-steps – "Preliminary" and "Detailed." The Build step also contains two sub-steps – "Implementation" and "Delivery." According to the theory of distributed cognition (Solomon, 1996, Hutchins, 1996), all the subtleness of a complex process does not reside in the head of one individual. While each member of the organization knows how to do his or her part of the process, the larger process is known only collectively – the ability to make informed decisions within the process is distributed across all people who work the process.

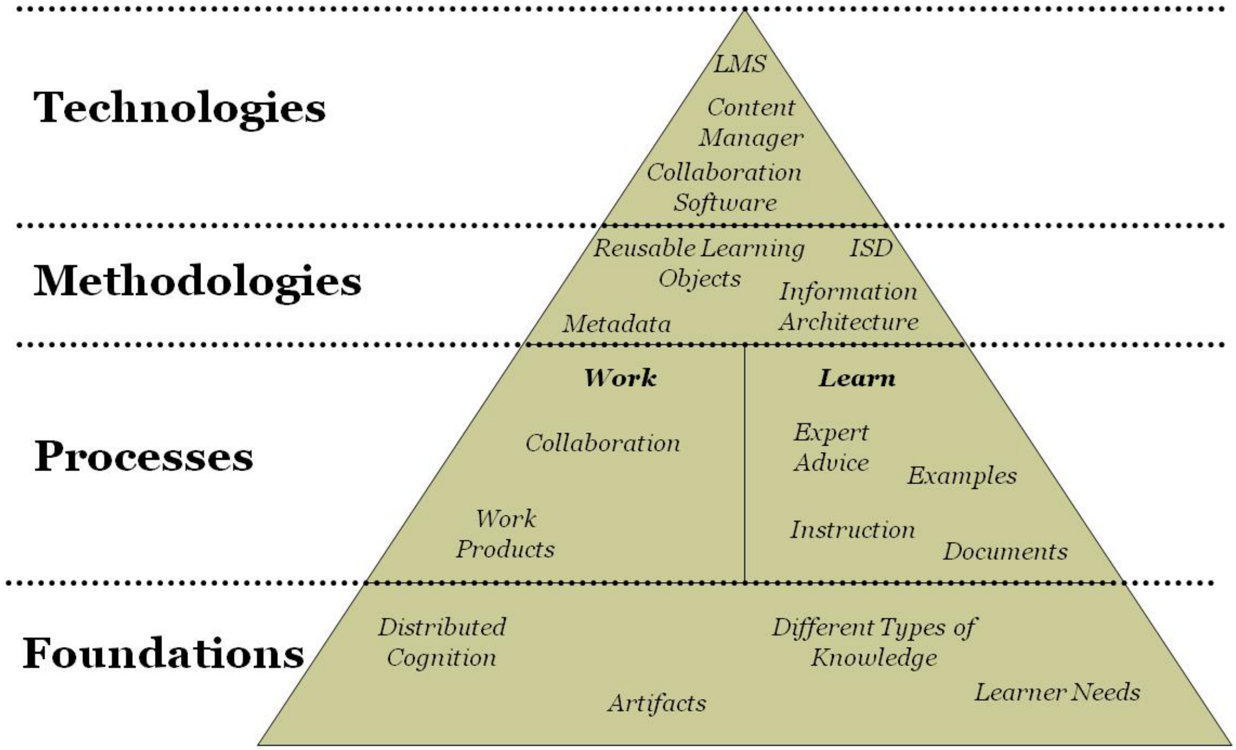

Figure 1. *iLearning* Framework for Managing Knowledge Work

Work Processes

This example also illustrates the second aspect of the theory of distributed cognition (Solomon, 1996, Hutchins, 1996). That is, cognition is distributed in the artifacts of the workflow process. Artifacts are used to capture decisions and information about the work that has been done in the workflow process The Design Document, the Quality Plan, the Testing Report, and the User Document are the artifacts for the example workflow process. Since they each have embedded knowledge about decisions that concern a unique aspect of the process, they each also represent a subset of the cognition needed to complete the entire workflow process. (See Nemeth, Cook, O'Connor, & Klock, 2004 for an overview on the importance of cognitive artifacts to the theory of distributed cognition.).

Additionally, this example shows the third aspect of the theory of distributed cognition -- the history of an artifact reveals the context for decisions and information about the process over time (Solomon, 1996, Hutchins, 1996). For example, if the Quality Plan is currently in version 2.0. This means that there were some major changes in the Quality Plan since version 1.0. The history of changes in an artifact tells the reasons "why" those changes were made. Frequently, it turns out that artifacts are historically related to one another. For example, when the Design Document goes from version 1.0 to 2.0, the Quality Plan will also go from version 1.0 to version 2.0 since the Quality Plan is dependent on the Design Document. In this way, the histories of artifacts provide important reasoning about their present form.

Up until this point in the article, the product of work was referred to as an "artifact." Recognizing the embedded nature of knowledge in these artifacts, they are referred to as "knowledge products" throughout the rest of this article. Every knowledge product has a set of criteria, or performance objectives that need to be met by its developers for its successful completion. These performance objectives are sometimes implicit – or in the "eye of the beholder." Recognizing the existence of these performance objectives but not able to easily articulate them is found in such phrases as "I know a good Quality Plan when I see one" or "shouldn't a Quality Plan have a…" Uncovering these underlying performance objectives is essential for improving the quality of the ongoing work in an organization. These performance objectives tell an organization what needs to be done and how well it should be done.

Borrowing from the field of Instructional Systems Design (ISD), one way to go about identifying performance objectives is to conduct a content analysis. A content analysis always starts off with the same question, "What knowledge does a person need to know to create this knowledge product?" (Davis, Alexander, and Yelon, 1974). That is, it focuses on identifying the cognitive skills needed to create the knowledge product. Cognitive skills underlie learning how to learn, that is, getting at the heart of the problem (Gagne, Briggs, and Wager, 1992). Once the knowledge is identified, it is listed by topic and each topic is rewritten as a performance objective. For example, the topic "Completeness and Correctness Criteria" is rewritten as the performance objective "In the Quality Plan, the developer will list all approved criteria for judging the plan as complete and correct." (For a complete description of the steps for conducting a content analysis and an overview of the ISD process, see Rothwell & Kazanas, 2004). The process of stating performance objectives begins by identifying the kinds of objectives that must be written. The most commonly used classification system for performance objectives was first described in 1956 by Bloom and his colleagues (Bloom, 1956). Performance objectives make a precise statement of what learner should "do" in order to accomplish the stated performance (Mager, 1997). They contain a performance component, a criterion component, and a condition component. The performance component describes how proficiency will be demonstrated. The criterion component describes how well the proficiency must be preformed. And, the condition component describes what conditions must exist when the proficiency is demonstrated. Performance objectives of a knowledge product provide the basis for creating metrics to measure the knowledge work of organizations. Measuring how well the performance objectives have been met provides data relating to the "quality" of the knowledge product. Measuring how much time is spent in creating a knowledge product provides data relating to scheduling and cost for the knowledge product.

Learning Processes

Figure 2 shows that when Anderson and colleagues revised Bloom's taxonomy, they made knowledge a separate dimension with four categories: factual, conceptual, procedural, and metacognitive (Anderson, et.al., 1998). They recast Blooms' other categories into a "process dimension" which describes the learner's cognitive processes when solving a problem in that category. Figure 2 also shows that novices are usually working at the level of trying to understand and remember. This is why it takes novices so long to get anything done. They are really "stuck" at the level of just trying to "get what's going on" and put it to memory. Also, Figure 2 shows that practitioners are usually working at the level of analyzing the situation and applying knowledge to form a solution. They already understand what to do and remember how to do it. Give them a problem similar to one that they have solved before and they will quickly analyze the problem and take a previous solution, adapt it, and apply it to their new problem. Finally, Figure 2 shows that experts should be working at the level of evaluating solutions and creating new and unique ones. The word "should" is put in this explanation because if an organization is using its experts like practitioners – doing the everyday work – then the organization is not getting the most from its experts. If the organization's experts are spending all their time on the work of the day, then the opportunity is lost for better ways to do tomorrow's work.

Figure 2 illustrates how to provide learners with appropriate knowledge assets. Of course, an appropriate knowledge asset depends on the type of knowledge that they seek. Novices use the system to become practitioners, practitioners use the system to become experts, and experts utilize the system to create new knowledge. In the process of becoming practitioners, novices seek to understand and remember conceptual knowledge. Instructional materials are appropriate knowledge assets for them as they provide access to conceptual knowledge. Note that novices will still require factual knowledge to fully understand and remember the conceptual knowledge -- similar to a student requiring access to the manual to understand the instruction presented in the classroom. In the process of becoming experts, practitioners utilize examples to analyze and apply procedural knowledge. Note that practitioners will still require factual and conceptual knowledge to apply and analyze procedural knowledge. Experts create and evaluate expert advice. By doing so, they provide access to metacognitve knowledge for others in the organization.

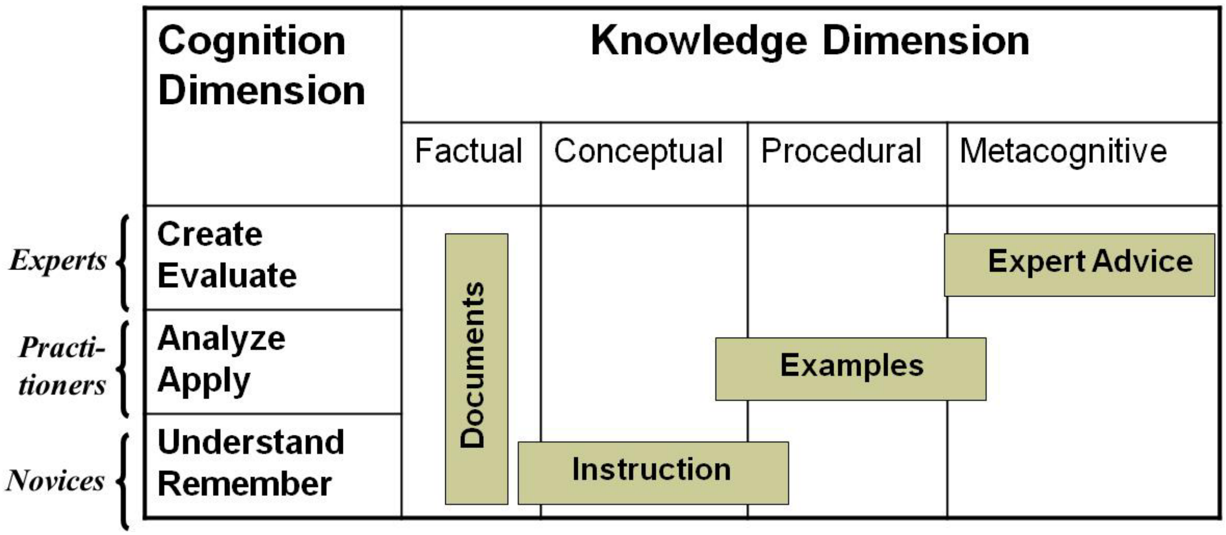

Figure 2. Differentiating Learners and the Knowledge They Seek

Methodologies

Considerable attention has gone into developing methodologies for reusing knowledge work in recent years. Much of it has focused on the methodologies for developing "learning objects" or "content objects" (Barritt and Alderman, 2004; Hamel and Ryan-Jones, 2002; Rehak, 2003; Robson, 2002). However, while quite a bit has been published on sharing knowledge, especially, in the area of communities of practice (Brown and Duguid, 2001; Lave and Wenger, 1991), little has focused on the mechanics of how to identify and track knowledge for reuse (Osterlund and Carlile, 2005; Wiley, 2004). The result has been that for most organizations, reuse is addressed only at the institutional level, if at all (Davenport, 2004).

The following example shows how performance objectives can be utilized for reusing knowledge work. It begins with two performance objectives that were originally developed for different tasks (writing Quality Plans and Testing Reports) and described differently -- but were later found to be fundamentally the same. This created the opportunity for ***reusing*** a knowledge asset. Since both performance objectives could now have the same identical text, this text can be a single document that is referenced by both performance objectives. This way, whenever the document for this combined performance objective is changed, it will be changed for users no matter which knowledge product they are working on (Quality Plan or Testing Report).

Figure 3 shows how performance objectives can be utilized for repurposing knowledge work. Performance Objectives 3, 6, 7, and 8 are very similar; workers will apply the same general principles and techniques to satisfy them. That means that a "common" document that describes what needs to be done can be used for all four performance objectives. This is also true for "common" instruction that describes why things need to be done and some "common" expert advice that describes how to do it. The document, instruction, and expert advice are shared knowledge assets. However, Figure 3 shows that not all knowledge assets are shared between the four performance objectives. Each performance objective has its own unique set of knowledge assets that describe the context (place in the process, physical site) in which the performance objective is addressed. This situation forms the basis for ***repurposing*** a knowledge asset. For example, when the Performance Objective 3+6+7+8 is accessed by workers writing a Quality Plan from Site A or Site B – or workers writing a Testing Report from Site C or Site D – they will see a common document, instructional module, and expert advice. (The "+" operator means that the four performance objectives share common knowledge assets, but each has additional knowledge assets that are not shared with the other others.) However, depending on what part of the process they are coming from (Quality Plan or Testing Report) or what site they are coming from (Site A, Site B, Site C, Site D), workers will see additional and different "contextual" knowledge assets. That means a worker from Site A trying to write a Quality Plan would see a document, an example, and expert advice specifically tailored for Site A, while a worker from Site B trying to write a Quality Plan would see a document, an example, and expert advice specifically tailored for Site B. On the other hand, a worker from Site C trying to write a Testing Report would see document, an example, and expert advice specifically tailored for Site C. And to be complete, a worker from Site D trying to write a Testing Report would see document, an example, and expert advice specifically tailored for Site D.

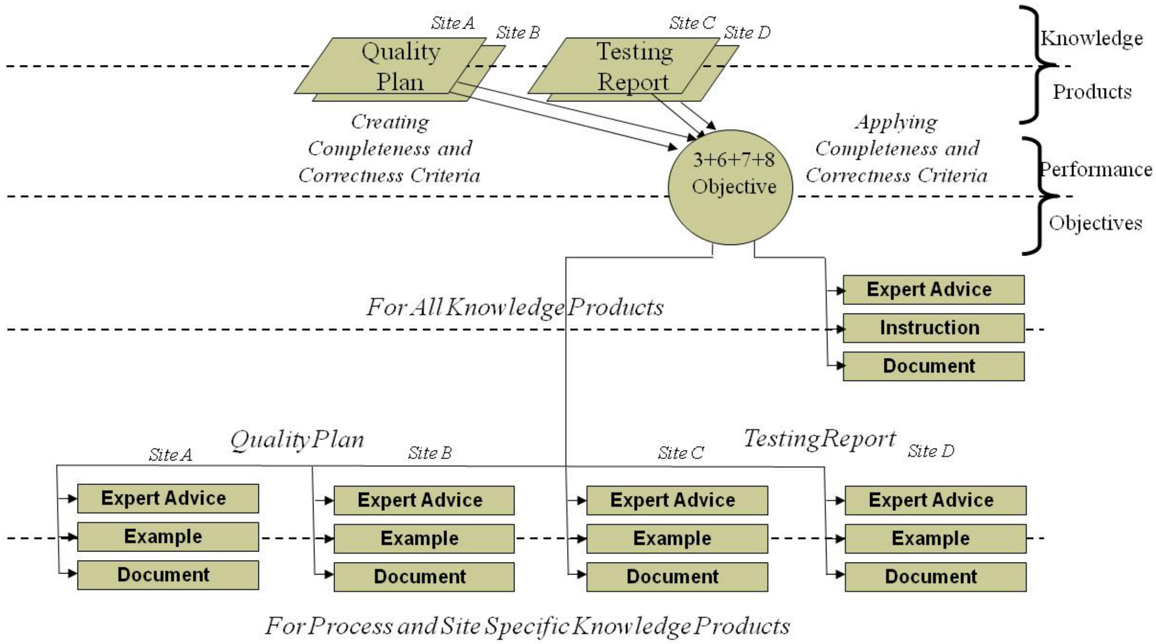

Figure 3. Repurposing Knowledge Assets

Discussion

This article describes the *iLearning* framework for managing knowledge work in organizations. The theoretical foundation for the *iLearning* framework, details how learning can be supported at the individual, team, and organizational levels. At the individual level, the *iLearning* framework supports learning in the context of the work at the moment – creating an "authentic context" for learning. At the team level, the *iLearning* framework supports learning in the context of a "distributed environment" where cognition is distributed across individuals, their artifacts, and the history of their artifacts. And, at the organizational level, the *iLearning* framework supports creating a knowledge spiral in an organization where transferring knowledge from one organizational member to another begins by the first member converting tacit knowledge into explicit knowledge before passing it on to another member of the organization -- who must convert it into tacit knowledge before he or she may use it. The *iLearning* framework also supports "different types" of learning at the individual, team, and organizational levels. It supports novices, practitioners, and experts in their need of different types of knowledge: factual, conceptual, procedural, and metacognitive.

Another aspect of the framework presented in this article is the use of performance objectives to uncover the drivers of knowledge work. These performance objectives provide the key for improving the workflow process and overall knowledge worker productivity. They determine what to measure for providing feedback and how to go about making improvements in the knowledge work. They also determine what knowledge to reuse and repurpose and why it should be reused and repurposed.

The major aspect of the *iLearning* framework, however, is the emphasis on improving learning in a continuous and integrated way in organizations. In the last twenty years, there has been a lot of thought and work in the area of managing work processes. Organizations have recognized the value for examining how they do their work and how best to optimize their processes to get the work done better and faster. At the same time organizations have recognized the value that learning as a group – or organization – improves the organization's ability to get the work done under changing circumstances. While a lot has been written about the learning that goes on in organizations, little attention has been placed on modeling that learning – at least, not in the same vigor that has been done with modeling and optimizing work processes. This article has put forth a means to model the "learning processes" of an organization. The premise is that for organizations to reach their potential, they must integrate learning into their work. Or said another way, effective organizations must be able to work and learn together -- concurrently. That means that the "learning processes" must be modeled and combined with the work processes. That's why the "pyramid" model for this article (Figure 1) has the work processes and learning processes on the same layer – it shows they "live in the same space, "occur at the same time," and are interdependent.

The view of learning presented in this article is an entirely different view of learning than the one based upon the "learning occurs after training" approach. In the learning occurs after training approach, training is done for tomorrow's production. When training is complete, workers will be able to apply that training when the opportunity presents itself. As a result of this view, training is typically looked upon as a "non-critical" input to production. It can be delayed, or eliminated, because there is enough time to develop a work-a-around for the missed training before it can affect tomorrow's production.

In a contrary view presented in this article, learning is part of the work process in the "learning during work" approach, and it has to occur during today's work process to get today's work done. It is essential to today's production, and without it, the work does not get done right and on time. In this view, eliminating learning, or delaying it, only reduces an organization's ability to get today's work done. Consequently, learning is looked upon as a critical part of the work process.

Methodologies are built upon the work and learning processes. That is, methodologies are used to model the products of knowledge work, the performance objectives of knowledge work, and the knowledge assets that are applied to complete the work. These methodologies define the granularity of knowledge assets, how they will be created, stored, displayed, and updated. Finally, readers are shown that managing knowledge assets by the performance objectives they address is the key to the reuse and repurposing of those assets.

Future Directions

Further work is needed to develop the interventions necessary to realize the whole of the pyramid for managing the life cycle of knowledge in an organization. One area should focus on empowering a leader to create a vision for managing the life cycle of knowledge in his or her organization. This vision includes why the "whole brainpower" of an organization is greater than the sum of its parts. It shows that value lies in the knowledge provided to customers and the only way to increase that value is by bringing more brainpower to it. And most importantly, it helps organizational members to paint a picture of what managing the life cycle of knowledge will look like in their organization.

Further work is also needed to utilize performance objectives for evaluating the performance of knowledge workers. From this perspective, performance should be evaluated in terms of the knowledge that individuals bring to bear on the problems of the organization. The contribution of individuals to the organization's "stockpile" of factual, conceptual, procedural, and metacognitive knowledge can be used as an information source for individual performance assessments. Obviously, a "count" could be conducted to quantify contributions to procedure manuals, online instructional modules, documented work examples, and recorded expert advice. However, as discussed in the section on learning processes, these contributions can take place informally -- sharing a fact, providing on the job instruction, sharing an example, or giving a nugget of expert advice. Further research is needed into the development of new methods for using performance objectives to "measure" and track these contributions.

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Student Response to an ePortfolio Initiative: A Grounded Theory Analysis

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Abstract

With the proliferation of eportfolios and their various uses in higher education, it is important for educators and other relevant stakeholders to understand the contribution of the student perspective to the planning and implementation of eportfolio initiatives. This research describes an eportfolio initiative at a large public university in the southeastern US. Data on student perspectives were analyzed using a grounded theory approach. Three interrelated themes emerged from the qualitative analysis of these data: purpose, support, and personal impact. The success of the eportfolio initiative is discussed in terms of these three themes, using the ePortfolio Implementation Support Model (ePISM). Results suggest that data on student perspectives are valuable not only in terms of evaluating the success of the initiative in reaching learner-centered goals, but also to inform the design and ongoing improvement of appropriate support.

Keywords: eportfolios, student perspectives, grounded theory.

Portfolios to ePortfolios in Education

The emphasis on accountability in the field of education brought on by the No Child Left Behind Act of 2001 (U.S. Department of Education, 2002) has increased the need for authentic forms of assessment. As educators have begun to measure learning based on performance on real-world tasks, it has become clear that a method of documentation is necessary to support this process. From the fields of art and journalism educators have borrowed the concept of portfolio assessment to meet this need. Fueled by the pedagogical pendulum swing toward constructivism, whereby students are given the tools for learning (Jacobsen & Spiro, 1995) and are guided toward self-discovery (Meeus, Questier, & Derks, 2006; Strudler & Wetzel, 2005), the portfolio method has seen widespread adoption in education. Salzman, Denner, and Harris (2002) report that 89% of colleges or departments of education are using portfolios as one form of assessing student outcomes.

Educational portfolios, constructed over a period of time, are a purposeful collection of work that can be used to document accomplishments, growth in knowledge, competencies, and skills, or provide a snapshot of learning at a given point in time (Barrett, 2001; Lorenzo & Ittelson, 2005). Wheeler (2003) suggests that the defining characteristic of a portfolio is its purpose. Similarly, Barrett (2007) notes that "the term portfolio should always have a modifier or adjective that describes its purpose." The intended purpose of the portfolio forms the basis for the inclusion of content. The versatility of portfolios has made them popular devices for a variety of purposes in education. Two basic purposes emerge from the literature: assessment and representation. For purposes of this research, we will consider only the assessment portfolio.

Portfolios can support both assessment *for* learning and assessment *of* learning. An assessment *for* learning portfolio is used to document progress in learning over a period of time. This type of portfolio supports the reflective practice that is essential to continuous improvement. The content of such a student-centered learning device is generally negotiated between the student and instructors. In many teacher preparation programs across the US, preservice student teachers develop these types of portfolios for reflection and to demonstrate their efforts, accomplishments, and progress in acquiring relevant knowledge and skills in a variety of teaching areas. In higher education portfolios are also used for accreditation reporting (assessment *of* learning). An eportfolio that is used for assessment *of* learning generally links examples of student work directly to program standards. Assessment *of* learning portfolios are often part of an assessment management system at the university or college level, used for accreditation reporting or other assessment and research purposes. The content of these types of portfolios is generally not controlled by the learner, so they cannot be strictly thought of as student-centered learning devices in the same sense as a portfolio with negotiated or student controlled content. Portfolios used for assessment *of* learning are generally the data collection component of assessment management systems.

The explosive growth of the Internet has ushered in the Information Age and added new terms to the educational discourse on learning. With the rise in the accessibility and use of networked computing, there has been an increase in the migration of learning and teaching tasks to computers (Siemens, 2005). This trend has fueled the creating and disseminating of portfolios using computers, and increased the viability of the portfolio as a communication tool, with the capability of reaching a much wider audience than was previously possible. Electronic portfolios (a.k.a., eportfolios) have begun to replace the cumbersome paper/binder portfolios and are eliminating concerns over transportability and storage of massive amounts of data. An eportfolio is a purposeful collection of electronic documents and multimedia objects that is formatted as a website. Students can generate their work in various multimedia formats, such as video, audio, graphics, and text, and use hyperlinks for organization and navigation (Barrett, 2005; Curtis, Yanes, & McWright, 2003). Curtis, Yanes, and McWright suggest that eportfolios make the student work "accessible, reviewable, and replayable," and address student ownership and storage issues.

Student Needs in ePortfolio Use

The shift to eportfolio development holds both blessing and curse. On the one hand, a digitized collection of artifacts enables a more efficient organization and review of past performance and facilitates the reflective process. On the other hand, as a stylized website, the eportfolio represents what Dillon and Zhu (1997) have termed the 'newest genre,' and necessitates the development of an entirely new set of skills related to web authoring. When an eportfolio functions as a student-centered learning device, as in the assessment *for* learning scenario described earlier, the benefits gained are contingent upon students' meaningful use of the tool. Siemens (2005) notes that, although higher education can introduce the concept, a successful eportfolio initiative must be driven by the learners' understanding of eportfolios as a tool for teaching and learning. Prospective teachers' understanding of the usefulness of technologies as learning tools needs to extend beyond the development of skills for using specific software applications, and into the realm of pedagogical rationale for technology use (NETS-T, 2002). It is therefore implicit upon higher education to provide effective support for both the new software skills and the development of an understanding of the pedagogical rationale for its use.

Considerations involved in supporting an eportfolio initiative in higher education are complex. Leon and Pearl Paulson (1994) describe the conflicting paradigms that coexist in eportfolio initiatives and the importance of separating the assessment management purpose (i.e., positivist portfolio) from the learner-centered purpose (i.e., constructivist portfolio) (Barrett, 2004). The positivist approach assesses student learning outcomes based on external standards, and assumes that meaning is "constant across users and contexts." The constructivist approach, on the other hand, "puts a premium on the selection of items that reflect learning from the student's perspective" (Paulson & Paulson, 1994). Upon initial examination of an initiative, one or the other of these components may be less obvious, but both dimensions of eportfolio use must be supported at an appropriate level if the initiative is to succeed.

Success with regard to the assessment management (positivist) purpose is evidenced by successfully accomplishing a goal dictated by external standards (i.e., accreditation of the institution; assigning a grade to student work). However, success with regard to the student-centered (constructivist) purpose is more difficult to gauge. The level of success will depend upon how well the level of support matches the level of need. It is therefore necessary to identify the level of student need in any given implementation. In this regard, data on student perspectives are valuable not only in terms of evaluating, ex post facto, the success of the initiative in reaching learner-centered goals (i.e., summative assessment goals), but also to inform the design and ongoing improvement of appropriate support (i.e., formative assessment goals).

Student Perspectives: Purpose, Support, and Personal Impact

Support for the positivist purpose (i.e., to manage a comprehensive assessment *of* learning) at an institutional level is directly related to the skill of the assessment team and the professional level of support provided by the team members. However, support for the constructivist purpose must address the needs of the student engaged in assessment *for* learning. Initially the student gauges the personal impact if the initiative fails to meet the constructivist goals. The level of support needed will depend upon what the student perceives as their stake in that purpose (personal impact) (Ritzhaupt, Singh, Seyferth, & Dedrick, in press). For example, if the student perceives that his or her stake in the purpose is high (i.e., a grade is dependent upon use of the eportfolio technology), then the need for support in developing the necessary software skills and understanding the rationale for its appropriate use will be high. If the student has very little to lose in the event that the initiative fails to meet its goal, then the needs do not exist and support is not necessary. For example, if the use of the eportfolio technology as a student-centered learning device is optional, the student risks nothing by not learning how to use it for that purpose.

Describing Success: ePortfolio Implementation Support Model

The success of an eportfolio initiative can be described in terms of the tension between the diffusion of the technology (Strudler and Wetzel, 2005) and resistance to its use (O'Hara, Watson, &Kavan, 1999). Kurt Lewin's Force Field Analysis (JPC, 2002) proposes that organizational forces are constantly seeking a state of equilibrium between support for change and resistance to change. Support for the adoption of innovation (i.e., diffusion) is in part based on personal impact to the stakeholders (Rogers, 2003).

Figure 1. ePortfolio Implementation Support Model

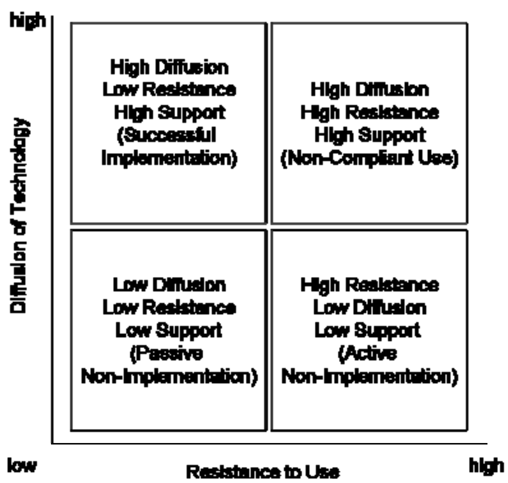


Figure 1 represents the structure of this relationship and conceptualizes this structure with descriptors for the four quadrants: High Diffusion/Low Resistance, High Diffusion/ High Resistance, Low Diffusion/High Resistance, and Low Diffusion /Low Resistance. Analysis of an eportfolio initiative should examine separately the assessment management (positivist) and student-centered (constructivist) purposes (Paulson & Paulson, 1994) and map the characteristic components (i.e. level of support/level of resistance) of the implementation onto the support model. In terms of the support model, a successful implementation will be characterized by High Diffusion and Low Resistance. This framework can be used to assess the various characteristics of an eportfolio initiative, and can be used to explain the outcomes of those initiatives.

The next section describes the study that generated the student perspectives data and the themes that emerged from the grounded theory analysis of an open ended student perspectives survey item (Ritzhaupt, Singh, Seyferth, & Dedrick, in press). That discussion is followed by application of the ePortfolio Implementation Support Model (ePISM) as a framework to explain the outcomes of two eportfolio initiatives. The initiatives described reflect two different approaches to eportfolio integration. Both the initiatives discussed were studied in the development of the EPSPI.

Method

ePortfolio Initiative

The eportfolio integration initiative described here was conducted in the College of Education (COE) at a major research university in the southeastern US. Two years prior to a reaccreditation visit from NCATE and the state Department of Education, the COE's research and evaluation team identified a need to improve the reaccreditation reporting process. The necessity of retaining required performance-based assessment measures, while at the same time enabling the manipulation and aggregation of data, pointed to the use of an electronic portfolio and assessment system.

A search began in early 2003-04 school year to identify an appropriate and affordable assessment management tool with an eportfolio component. The research and evaluation team narrowed the search to three web-based applications, and presented findings to a committee appointed by the COE Dean. The committee was made up of faculty representing each teacher preparation program in the COE. Of the applications examined, the Chalk & Wire ePortfolio © system provided the most powerful reporting package and appeared to have the most flexible and responsive support system for students.

Since the system was to be used as an assessment management tool, it was imperative to incorporate national, state and local performance standards for each program. Research and evaluation team members worked very closely with faculty and department chairs to identify critical assignments in the curriculum that would demonstrate evidence of each standard, and to develop detailed rubrics with multiple performance indicators.

A small cohort of Elementary Education students and faculty volunteered to beta test the system in spring semester of 2004-05. By the following fall semester 2005-06, there were six programs using Chalk & Wire ePortfolio ©. Faculty members were provided with an ePortfolio © account in which they could access the submitted student work and attach it to the corresponding rubric to assign grades and feedback electronically. Students were required to purchase a one year subscription for a cost of less than fifty dollars. Subsequent renewal subscriptions cost approximately half of the initial fee and were available after graduation. By the end of spring semester 2006, there were over 1,100 student subscribers, over 300 rubrics, and twelve sets of program standards.

A help desk support system was established in spring of 2004-05, staffed by three undergraduate students. Communication was limited to email, until the end of the spring semester when a small lab facility with six computers and a telephone became available. Help desk staff set up a series of orientation trainings, scheduled in the college's open use labs, and facilitated periodic training sessions for both students and faculty. In the fall semester of 2005-06, the help desk went online with a resource website, providing online training registration capabilities, and access to printable resource materials and tutorials.

Procedures

In the 2005-06 spring semester, a team of researchers adopted and tailored an instrument known as the Electronic Portfolio Student Perspective Instrument (EPSPI) (Ritzhaupt, Singh, Seyferth & Dedrick, in press) to evaluate the progress of the eportfolio initiative. The instrument was accessible in a web-based format and was accompanied with an open-ended survey item soliciting additional information "Please provide any additional comments, concerns, or suggestions". The researchers posted a hyperlink to the instrument in the announcements section of Chalk & Wire ePortfolio © and sent an email with a hyperlink to the instrument to all students using the system.

The survey was available for a three-week period, and during this time, two emails were sent to students. Respondents were informed that the purpose of the research was to: (1) monitor the progress of the eportfolio initiative, and (2) aid in the development and validation of an instrument designed to measure student attitudes and intended uses of eportfolios, namely EPSPI. Additionally, participants were informed that the survey was anonymous and that the information would not be divulged in any way.

Participants

Two hundred four of eleven hundred students completed the instrument anonymously. Of the respondents, approximately 95% were female. Approximately 50% of the respondents reported senior classification, 25% junior classification, and the remaining 25% reported graduate level status. Of the ethnicity of the respondents, 78% reported Caucasian, 11% Hispanic, 5% African American, and the remaining 2% reported either Asian or Other. The participants reported using the eportfolio system for an average of 9.77 months (SD=5.51). The eportfolio system had been in use for 18-months when the instrument was released. Ninety-one of the students responded to the open-ended item.

Qualitative Analysis

The open-ended survey item included with the quantitative survey provided fruitful information, complementing the quantitative survey. To systematically analyze the responses, three types of coding procedures were used in the grounded theory method (Strauss & Corbin, 1990): open coding in which the themes, or categories, and subcategories were identified and grouped, followed by axial coding in which the categories were restructured to show different relationships, and finally selective coding in which an emergent theory regarding the data is discussed. Open coding of the responses by two readers revealed four major themes: (a) system characteristics (b) support system (c) purpose (d) personal impact. Inter-rater reliability was calculated at .87. Identification of properties, or subcategories, provided detailed description of each theme. It was decided that the system characteristics theme (i.e., ease-of-use; support for application skills) was a subcategory of support. Thus, for purposes of this paper the four themes were collapsed into three: (1) purpose, (2) support and (3) personal impact. Based on the need to distinguish purpose (i.e., positivist or constructivist) in the analysis of an initiative, as discussed earlier, purpose was chosen as the central theme and an axial coding method was used to reorganize the other categories and restructure their relationships. Following is a discussion of the relationship between these three themes.

Results and Discussion

In the first theme, Purpose, participants expressed confusion and dismay at the purpose of the eportfolio system and process. Most participants clearly rejected the use of the eportfolio for seeking employment with statements like "I will never use it for future employers" and "I do not believe this is what potential employers want to see." The subcategory 'learning' included mostly negative comments: "… not a good reflection of my work" or "many of the tasks that we are required to submit to Chalk & Wire are not examples of my best work".

In the second theme, Support, the majority of respondents felt that training and the help desk style support system did not meet their needs in various ways. These responses ranged from a general lack of awareness about the available support to inability of the system to anticipate and address diverse ways of learning. A major aspect of this theme involved faculty buy-in and support for student use of the system. More than 25% of the respondents mentioned that faculty members did not offer help with using Chalk and Wire and did not appear to understand the program themselves. Another dimension of this theme indicated that the faculty did not value the system and many instructors required hard copies of assignments in addition to electronic postings.

The third theme, Personal Impact, included responses about the investment in time and money, comments indicating predominantly negative attitudes toward use of technology, feelings of lack of choice and control, and other various emotional factors like "adds unneeded stress". In summary, the qualitative analysis revealed an overall negative response to the eportfolio initiative.

ePortfolio Implementation 1: An eportfolio initiative was piloted with twenty-six students enrolled in an introductory computer science course in a college of engineering at a mid-sized university in the southeastern US. Use of a free-form authoring system for developing an eportfolio was incorporated into the curriculum of this course, in which students created their eportfolios to reflect meeting the learning objectives in the coursework. Use of the eportfolio technology in this implementation was centered between the assessment management and constructivist purpose. For example, the eportfolio included a predefined structure containing elements that may be found on a resume, such as the student's name and picture. Additionally, for each of the assignments, students were required to post a description, reflection, and a list of learning objectives. Thought the assignments had minimal expectations, the students had a high degree of flexibility in how/what they submitted to complete the assignments.

Figure 2. Implementation 1: Assessment Management Purpose

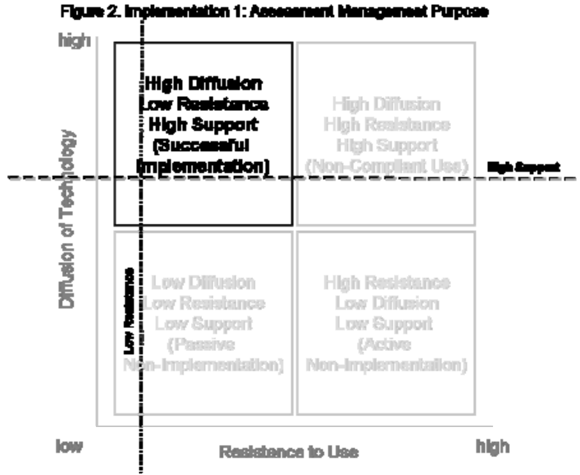
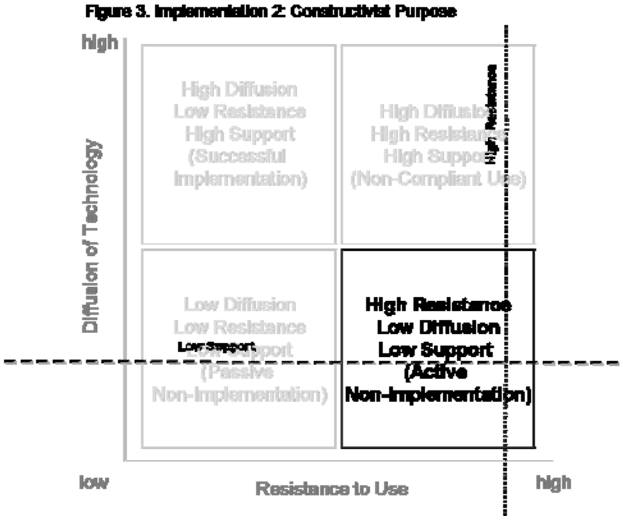


Figure 2 represents the relationship between the degree of diffusion of the technology and the degree of resistance by the students. Because use of the technology was an integral part of the coursework, each student used the technology: High Diffusion. Every student used the technology as it was intended to be used (i.e., in creating an assessment portfolio): Low Resistance. The strength of the support structure can be discussed in terms of the two component parts: support for the development of (1) software application skills and (2) pedagogical rationale for technology use. In this implementation, there was strong support for the development of application skills, because the students developed the eportfolio in class with the assistance of the instructor. Likewise the instructor's incorporation of eportfolio into the instructional activities provided strong support for pedagogical rationale for the use of eportfolio technology in assessment. Data from the EPSPI survey administered in this class indicate that overall the student reaction to the use of the eportfolio for the purpose of assessment management was positive; the implementation was successful (Ritzhaupt & Singh, 2006).

ePortfolio Implementation 2: The eportfolio initiative used for the qualitative analysis can also be reassessed using the ePISM as a framework. Use of the eportfolio system for assessment was established by the administration as a graduation requirement; faculty members were also required to use the tool in reporting grades: High Diffusion. Accreditation goals were met and the initiative appeared to be a success. However, results from the EPSPI indicated that approximately 20% of the participants were dissatisfied with the implementation of the eportfolio initiative (Ritzhaupt, Singh, Seyferth, & Dedrick, in press). In contrast to the first implementation, in which over 90% of the students said that they would use eportfolios to guide their skills development, 72% of the participants this initiative said that they would *not* use the eportfolio to guide their skills development (Ritzhaupt & Singh, 2006; Ritzhaupt, Singh, Seyferth, & Dedrick, in press). One possible explanation for this discrepancy comes from an examination of purpose.

In this implementation, students were required to purchase a subscription to the eportfolio technology. Thus, the personal impact if the initiative did not meet the constructivist goal was relatively high (i.e. students perceived the purchase of the subscription as a waste of money). Student responses to the open ended item on the EPSPI indicate that the technology was not used as a student-centered learning device: Low Diffusion. Further, faculty resistance to the use of the technology other than for assessment reporting was very high: High Resistance; characteristically, the two support components (i.e., (1) software application skills and (2) pedagogical rationale for

Figure 3. Implementation 2: Constructivist Purpose



technology use) were not in place. In terms of the constructivist purpose, the implementation appears to have been unsuccessful (See Figure 3).

Closing Remarks

This paper has analyzed student responses to an eportfolio initiative using grounded theory, and described three interrelated characteristics that emerged from a student perspective: (1) purpose, (2) support and (3) personal impact. Understanding of these characteristics and their interrelatedness is critical to the success of an eportfolio initiative. Additionally, this paper provides a parsimonious framework to assess the outcomes of eportfolio initiatives: the eportfolio Implementation Support Model (ePISM). The ePISM has two key dimensions (resistance and diffusion), which were used to explain two divergent instantiations of an eportfolio initiative. These results suggest that data on student perspectives are valuable not only in terms of evaluating the success of the initiative in reaching learner-centered goals, but also to facilitate the planning, implementation and ongoing improvement of eportfolio initiatives.

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Troubleshooting Windows Movie Maker: Common Student Errors and Effective Instructional Solutions.

Andrew J. M. Smith

As part of the infusion of technology into schools, teachers frequently require their students to present a summary of their work in some electronic format. Often the media specialist is charged with teaching the various software products that allow students to present their work in new and interesting ways. Microsoft PowerPoint has been the favorite of many teachers, but increasingly Windows Movie Maker has been gaining popularity as a presentation medium because of its availability, its low cost, and the fact that it runs on the Windows platform which is generally available throughout the school and in students' homes, rather than requiring a Mac platform.

Such software products now give students and teachers enormous amounts of computing power, and the ability to perform tasks that until relatively recently required expensive editing suites and enormous amounts of expertise. While there is no substitute for expertise at the professional level, students are still able to accomplish many tasks satisfactorily, and to produce good quality products.

However, students are prone to make certain errors in software manipulation. While some of these are specific to the Windows Movie Maker software package, many more of them are generic problems that surface for almost every software package, and which can determine whether or not the student is successful and has a positive experience with technology, or ends up frustrated and discouraged, vowing never to use the technology again.

Bad technology experiences, particularly with video programs, can lead teachers and media specialists to question whether the extra effort in learning Windows Movie Maker is worth the bother. After all, video editing is too complicated, and we can accomplish everything with PowerPoint. In addition we don't have enough video cameras for all our students to use, and, in any case, iMovie does it all better, doesn't it?

The truth is that the basic skills are not too complex for teachers and students to master and, while PowerPoint has become very powerful, there are still some things it cannot do, or perform as easily as the Movie Maker product. In addition, you do not actually require video footage to work with Movie Maker – still pictures can be used to produce very effective pieces, making use of the various transitions and effects to give the impression of movement. (The iMovie/Movie Maker debate will not be discussed here beyond saying there are some things more easily accomplished in one program, and others more easily in the other.)

This paper is based on one teacher's experience of teaching Windows Movie Maker over a three-year period at the college level to both in-service and pre-service media specialists. An examination of teaching notes from all three years has revealed a pattern of errors that frequently recur while students construct video projects, both large and small.

File Naming and Saving

Before any work can be done in the production of a new media product in Movie Maker, the students must have source material. This is in fact the source of the greatest number of problems encountered. This stems from three major problems: 1) a failure to understand file structure and how to save files, 2) the lack of understanding of the difference between a Movie Maker Project file and a finished Movie file, and 3) constant transfer of projects backwards and forwards among various computers, without knowing where the source files are saved. The most obvious manifestation of this error is when students open a project and discover a string of large red crosses across the screen instead of the carefully crafted movie they expected.

The solutions to these problems are straightforward, and apply to many different software programs and projects. Firstly, it is most important that students learn how to save files properly. They need to understand the way files and folders are arranged, and how they can create their own folders. Too often teachers assume digital native students have a firm grasp of basic computing skills, but while they may be adept at manipulating various technology and software tools, their basic understanding is frequently lacking, mostly because their skills have been picked up on the job through trial and error, rather than through a comprehensive, organized system of instruction. It is also worth remembering that most of these computer-based organizational structures are in fact based on old fashioned paper filing systems – familiar enough to the older generation, but unfamiliar territory to the digital native. Secondly, life is greatly simplified by teaching students to give files unique, descriptive names. It is much easier to help students work with files named, for example, "Autumn Leaves 2007" rather than "project 1". Lastly, the single most effective antidote to the red crosses is to encourage students to create a new folder for each project, into which they put all captured video for the project, as well as all pictures and sound files they will use. Students should be strongly encouraged to assemble everything in that one folder before commencing the movie editing. In particular, students should be discouraged from importing or cutting and pasting from other sources directly into the program. The video creation process is made considerably easier by assembling all materials together, then importing them all into the same Movie Maker collection, to simplify creation of the final product. (A particular danger spot is when students are capturing video from a source directly into the computer, as they are often unaware of the default target folder to which the video will be saved.)

Selecting the Source for Insertion

Although students may create a folder to assemble all the component parts, they do not always take care when importing those materials into a collection, and frequently import video from the default capture folder, rather than the project folder they created. This will work perfectly well if the entire project is completed on that computer and the movie finished at that time. However, if the work is saved as a project and then moved to another computer, the target files will not be identified and the red crosses will appear in the project. Again this highlights the necessity for students to pay particular attention both to where they are saving component files – videos, pictures, and music – in the first place, as well as to the source from which they import the components before adding them to the actual project. (Movie Maker does have a feature to allow you to search for missing files, but it is preferable for the students to understand the process properly from the beginning, so this is not required.)

It is also imperative students understand the difference between a Movie Maker project and a completed Movie Maker video. The project is simply a set of instructions referring to the various videos, pictures, sounds and other elements. It previews how the finished video will look and sound, but everything is changeable until the movie is finalized. When various elements are inserted into the storyboard or timeline, the program only inserts a placeholder there. The actual material still resides in the source folder, and is previewed as needed while working on the project. Only when the video is finished or finalized are the various components actually brought together or rendered into the actual video file. It is this rendering process that can take some time, and explains why the process of saving a project is almost instantaneous, but the process of finishing a movie takes significantly longer. The project file therefore contains only placeholder and editing information (e.g. insert clip 1 here, fade in, use overlay title "Autumn Flowers" etc.) while the video file contains the actual video footage, audio, pictures, titles and captions in finalized form for showing on a computer or other display device.

Planning and Process

Many more difficulties arise if students are not encouraged to plan their projects in sufficient detail before commencing the software manipulation. Common problems caused by lack of planning fall into two major categories: lack of materials or inappropriate materials (copyright and fair-use wise) and editing problems based on sequence of editing. Students frequently embark on projects by focusing on the technology itself, rather than the desired end product. This may be a function of how we teach new technology products, although there is always the novelty factor of the new software as a distraction, even if planning is emphasized. If the focus is on the technology, then little thought is given to planning, including scope, duration, required resources, and expectations. However it is these elements that are crucial to the success of any video project. It is helpful to remind students that while the software affords them unprecedented technical opportunities, it does not automatically grant them film-making expertise. This is a learned skill, and just as any motion picture starts with months of careful planning long before any film is shot, so the simplest Movie Maker project requires to be thought through insufficient detail to ensure the project is manageable within the available time, all component materials are identified and located, and the process can be finished in a professional and timely manner. Storyboarding is a useful aid to setting up any video project, but even simple projects using only still pictures will run more smoothly if an outline is created and materials identified before any actual software editing takes place.

Identifying and obtaining materials can also be areas of complication. Original pictures, video and music can present problems of access or composition for students although they are generally free from copyright problems. Often component materials can only be obtained from other sources, and in these instances care should be taken to ensure materials used are royalty-free or may be used under the fair-use guidelines. Particular attention should be given to the end purpose of the students' videos. If these will be posted on the web or in some other public access forum, then copyright issues must be addressed. The ease with which copyright materials can be obtained, copied and reused does not release us from the obligation of teaching our students the ethical use of such materials. A checklist of all required materials can be a useful aid to ensure all necessary components are assembled before the software portion of a project is begun. Checklists can detail general or specific requirements for videos, pictures and sound, and can also serve as shooting scripts to help students identify which shots they will require to complete their projects. A useful exercise is to give students a specific topic to research, then to give ten minutes for research and planning, ten minutes for component gathering, and ten minutes for software manipulation. This encourages students to think ahead about what they will need, to identify available resources, but most of all, to work with the materials they have. This above all else demonstrates the necessity of research, planning and organization. If there is no plan and materials are not there, there is little substance to the project, but even a small number of materials in a well-executed plan can result in a quality project, albeit limited in scope.

The sequence of editing events within a project can also cause problems for students. This most frequently occurs when students are working with separate audio tracks and complete all video and sound matching editing before thinking about titles and captions. Often the carefully synchronized materials are displaced with captions and titles and much hard work is lost. Again it is worth reminding students of the order in which professional filmmakers work, where sound is added after the visual portions are edited. In this case students need reminding that the titles and captions are visual elements as much as pictures and video clips, and require to be inserted before final music or soundtrack adjustments are made. Another technique that may be helpful is composing a project in smaller pieces. Movie Maker is a fairly straightforward and basic video editing tool, but although it lacks many features of professional editing suites, we can accomplish more complex projects simply by changing how we use the software. Instead of trying to complete many complex synchronizations of soundtrack or narration with many video clips or pictures in one project, smaller component parts may be finished as movies in their own right, then brought back into the project collection and inserted into a new project as whole pieces. In this instance the addition of new titles or the repositioning of various elements does not affect the formatting of the intact component pieces. This is also an easy way to add an additional audio track, if required. The original movie with video sound and separate audio track can be finalized as a video, thus combining all the elements into the one track. If this is now inserted into a new project all previous elements are contained within the picture and audio sections of the video track, and a new, blank audio track is now available (as are new title tracks and so on.)

One last word on planning must be said. All video projects take more time than we think to complete well. Even if the students are technologically savvy, there must be sufficient time allowed for research, planning, materials collection and project assembly. Care should be taken to ensure that teachers' expectations are realistic, given the available time for these activities. In addition, thought should be given to whether students can gather the required materials easily, safely, quickly, and legally. Projects with a smaller scope and well-defined expectations generally provide a better learning experience.

Shooting Video and Audio

There are a variety of common mistakes students make while actually shooting video. While there are a variety of excellent books which give detailed instructions on how shoot good video, there are some basic flaws instructors should highlight to minimize the distress to students when they discover they have unusable footage. Before any shooting takes place a plan must be created that details all the various elements the students will need for their final projects. Without a plan or a checklist, the process is simply haphazard and essential elements will be missing, while extraneous footage will be shot. Perhaps the most common error here is not giving enough lead time for the camera to start filming before the interviewee talks or the event happens. Most cameras do not start filming immediately the start button is pressed, but take a few seconds to warm up and then fade in to the picture. If there is no lead time on the raw footage, it is extremely difficult to make satisfactory edits on the finished product, and the editing becomes jumpy and disjointed. Although we don't want to waste digital video tape, a good ten seconds at the beginning and end of every shot is a wise investment for the editing process, and saves a poor result or the necessity of shooting the video again, which is not always practicable.

Light, or lack thereof, is the next most common shooting error. Students must be taught to understand that while the human eye can distinguish detail in varying patterns and intensities of light, video cameras are much more limited in their ability. More light is usually required indoors to ensure the picture quality is adequate, and it is often helpful to encourage shooting to take place outdoors where there is an abundance of natural light. (This, after all, is why the very early movie studios set up shop in southern California.) However even outside, care must be taken that light is shining directly on to the subject of the video from the front and that the light is not behind subject, causing it to be in silhouette. A worthwhile exercise is to have students film short sequences in different parts of a building and in different locations outside, so they can experience the effects of different lighting on the quality and clarity of their videos. Again student scan be reminded of the correct sequence of events by thinking of the classic professional movie line, "Lights! Camera! Action!" which illustrates what is required to shoot video correctly.

Another area of difficulty for novices is that their video footage is either shaky or out of focus. If there is an auto focus feature on the camera, make sure it is turned on, as this will enhance picture clarity. However if the camera is moved about too quickly, the auto focus will not be able to help, for the auto focus needs a few seconds to register what is in the viewfinder and bring that into focus. If the camera is sweeping or panning too rapidly, the camera loses track of what is in the viewfinder and focus is lost. This also means that the camera should be held steady for several seconds focusing on one thing, before moving. As well as helping with the focus problem, this also allows the viewers to develop a context for what they are seeing, rather than being disoriented by rapid camera movement. In addition to the auto focus, most cameras also include an anti-shake feature, which can lessen the effect of movement by the camera operator. However it cannot completely compensate for shaky hands, so student should be advised to use tripods or monopods, or to practice other stabilization techniques if neither of these is available. Indoors cameras may be placed on tables, shelves or any level surface, or the camera operator can brace him or herself against a wall or a piece of furniture. Outdoors trees, street furniture, and walls can all provide support, and if all else fails the camera operator can brace the elbows against his or her own body to reduce camera movement. Each of these techniques can be effective in reducing shaky or out of focus video, and they are easy to implement as long as students are made aware.

A last but equally important area of difficulty in shooting video occurs with sound. In most cameras the built-in microphone is simply not adequate to capture sound from more than two or three feet away, and the resulting video footage contains much more ambient noise than the desired audio. In such cases an external microphone can make a substantial difference to the sound quality. Even a very basic microphone can make the difference, which is based more on proximity to the desired sound source than on the quality of the microphone itself. Note however there appears to be a trend in new, lower priced video cameras to eliminate the external microphone jack, thus removing this easy solution. Media specialists should take care when purchasing video equipment that this necessary feature is included.

Software Manipulation and File Size

Once all suitable materials have been gathered, there are traps for the unwary in the editing process. Students often fail to recognize the difference between the storyboard view and the timeline view and the different tasks they can accomplish in each view. While everything can be edited within the timeline, the storyboard gives an easier interface for adding transitions and effects, particularly for younger students. The storyboard also gives an excellent pictorial overview of the project and may be used to identify missing transitions or effects. The timeline can be more complex, and students often encounter difficulty by endeavoring to work on the timeline at too low a level of magnification. For there are helpful zoom in and zoom out buttons which allow the timeline to be expanded for very precise editing or to see fine detail or reduced for more global edits or to see the bigger picture. Both the timeline and storyboard views will be required in the course of even a modest project, and students should be encouraged to experiment with them, discovering for themselves which editing tasks are more easily performed on each.

A final problem area concerns saving the final project as a movie. This ties back to the idea of students knowing the difference between a Movie Maker project and a finished video. If students are working with all their component parts inside a project folder on their own USB drive, they must understand that the process of finalizing the movie will result in the creation of a new file at least as large as all the component pieces they have inserted into it. It is at this stage that things go wrong. Often students are working on USB drives that are full to overflowing and have not the capacity to save a file the size of the finished video. It is especially crucial at this stage that students do not delete the component parts of their video (since they have already used them in the video and don't need them any longer!) before the movie has been finalized or rendered. A good solution is to have students finish the video to the hard drive of the computer on which they are working, and then, only when the completed work has been checked, space is cleared on the USB drive and the completed work saved. Note that this method destroys the source material and will preclude easy edits to the project, should they become necessary. Many computers offer the option of finalizing movies directly to CDROM or DVDROM, but, in practice, this seldom seems to work, and it is safer to finish the movie to the hard drive and then copy it to a new storage medium.

Finished size and quality can also problem encountered at the end of the project. Students must be taught the relation between file size and video quality and that videos designed for tiny personal players with two inch screens will not look nearly as good on large computer monitors. In addition, it is often at this stage that students realize that some of the materials they selected for inclusion started out with lower quality, which is only exacerbated by the compression techniques employed in rendering video. In particular, still or video camera settings may be changed to allow for the capture of many more pictures or minutes of footage, but there is always a cost, and that cost is quality. If quality is compromised early in the process, there is nothing that can be done at the editing stage. However higher quality (and therefore larger) components can always be reduced or compressed more during the final editing stages, with less sacrifice of clarity.

Summary

While it may appear video projects contain too many hazards for students to negotiate, software such as Windows Movie Maker offer an excellent tool to students of all ages for assembling and presenting information effectively. This paper has endeavored to highlight some of the most frequent student errors encountered with this software, and, by offering some solutions to these problems, allows media specialists and teachers to prepare students ahead of time, so as to minimize their impact. At a time when technology literacy is increasingly assumed to be present, there are large holes in students' basic understanding of how software operates, and the most effective way for them to interact with it. The more we can identify the problems and offer effective solutions, the better prepared our students will be, and the better they themselves will be able to use the technology tools available to them.

SDAIE Online and Intercultural Competence: Theory into a More Flexible Practice for Course Designers

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Abstract

This research proof of concept design study examined how this researcher adapted the SDAIE (Specially Designed Academic Instruction in English) model as a guide for designing cross-cultural online learning experiences. SDAIE is designed to overcome cultural and language learning barriers in academic courses for international/diverse/ESL students. This intentionally designed holistic case study explored the benefits of applying a conceptual design tool, SDAIE, to an online environment. The primary research question for this study was: In what ways can the same benefits of a low-risk and safe environment in a face-to-face (F2F) SDAIE course design be realized in an online course design? An actual SDAIE Online course was designed, developed, and instantiated with a specific focus of using the SDAIE components of low-risk and a safe environment for seven Hispanic and Latino college age bilingual learners. Data was collected on each of the participants during a five-week period. The findings are reported from participant responses given during a formative evaluation. Data from the study are presented in tables, participant narratives, and investigator comments. Participants' favorable response to the SDAIE methods and strategies suggest that these learners received similar or some of the same benefits while participating in this SDAIE Online design instance as they would in a SDAIE face-to-face course as it was implemented with three SDAIE subcomponents. Design recommendations are given for the intended audience of this design study, who are instructional designers, course developers, and instructors, that they may discover the stage of intercultural competence they are use in becoming more culturally sensitive in their views, lives, and work applications.

Introduction

With improved software and global connections, instructional designers encounter more international students and diverse learners as they design and export course content via the Internet and blended courses. Due to the need of being aware of the difficulties of designing instruction for students from various cultures, the impact of culture in instructional design practice should influence how design is approached. Many designers are currently unable to develop instruction that accommodates different cultures well. Cultural sensitivity is not exhibited in the technological tools as much as it is in the pedagogical process of using a variety of models to design and implement instruction (Chen et al., 1999). The area of training instructional designers to gain cross-cultural competence is still in its infancy in designing culturally responsive interfaces, lessons, and course elements. Neither educational courses offered by designers nor thinking skills of students are culturally neutral (Kern, 2006; Singh and Pereira, 2005). Many are unable to develop instruction that accommodates differences in the various worldviews, expectations, living and learning styles, or preferences of diverse academic or work group expectations. Therefore, research is necessary to find designs or models that allow for effective learning across cultures (Henderson, 2007).

Literature Review

In looking for a beneficial design tool for learning across cultures, I considered what designers could use to adjust content and create online materials for learners who represent various cultures, contexts, and viewpoints that vary from the mainstream. To solve some design problems that influence online course culture shock, dropouts, and cultural insensitivity in courses, my research and development project focused on use of a design study (Design-Based Research Collective, 2003; Gibbons & Bunderson, 2005). Three basic approaches for designers to use in knowledge-producing research are to explore, to explain, and to design. This design study involved adapting a face-to-face (F2F) tool and model to eLearning use. I selected the F2F conceptual tool, SDAIE, which is pronounced Suh–DYE. SDAIE is a conceptual design tool and pedagogical tool, "an evolving instructional process that includes teaching content and English language development simultaneously" (Cline & Necochea, 2003).

SDAIE was implemented 25 years ago to overcome cultural and language learning barriers in academic courses for bilingual, international, and English as a second language students (Balderrama & Díaz-Rico, 2006; Krashen 1981). "California developed the term SDAIE to draw a distinction between programs that provide rigorous academic curriculum and those which do not" (Sobul, 1995, p. 7). For example, teachers in California are required by law to apply SDAIE methods in their courses, pass a SDAIE certification test or hold bilingual education certification in order to teach. By combining factors such as international learners' and ESL students' needs with the power of applying F2F SDAIE methods to an online environment, I coined "SDAIE Online".

Method

This SDAIE Online research involved creating the design, development, and implementation of a prototype computer-assisted language learning (CALL) course as a proof of concept. The intent of this exploratory design study research with qualitative methods was to offer designers more design options based on SDAIE methods and strategies. The applied research approach studied an online phenomenon that did not exist yet but was instantiated a small pilot study as a design case and was used with bilingual Latino speakers of Spanish and Portuguese. This effort fell into the category of an intentionally designed holistic single case study or a "design instance" (Reigeluth & Frick, 1999). Another purpose of this design instance was to help international students interact with content that often requires more knowledge of the cultural and educational schemas that designers assume learners already know (Stewart & Bennett, 1972; Valdes, 1986).

SDAIE has seven main components (Cline & Necochea, 2003), but the research focus was on one SDAIE component. Since most of the other SDAIE components have been researched and tested with results (Chamot & O'Malley, 1994; Echevarria & Short, 2004; Echevarria, Vogt & Short, 2000; Hinkel, 2005), I focused on the component of low risk and safe environment. I chose this for my course design and data gathering because there is a gap in the research with no direct results from a proof of concept application on the benefits of such an approach as in my research study. The research methods included gathering various types of data (interviews, observations, assessments), which were analyzed for the holistic case study. The formative evaluation utilized observations, homework response documentation, questionnaire results, and interview statements taken before, during, and after the implementation phase of this study.

The primary research question for this study asked in what ways can the same benefits (Hinkel, 2005; Kern, 2006; Warschauer, 1999) of a low risk and safe environment in a F2F SDAIE course design be realized in an online course design? This research question guided a related research question: What does implementation look like in an online ESL learning environment when designers add three SDAIE design sub-components that create a low risk and safe environment in a F2F setting? These sub-components include: (a) guides and learning companions, (b) scaffolding for a low affective filter, and (c) short initial overview and technical training lessons on using online lesson components and navigating the system. It is usually more problematic for ESL students who take F2F and online courses to complete courses without these components (Aykin, 2005; Gunawardena, 2003; Palloff & Pratt, 2003).

To examine this research question of designing a low risk, safe environment, I implemented the SDAIE Online course, "Communicating in North America". The course was uploaded to a professional hosting website in Texas. As the subject matter expert and course designer, I was also the instructor for this SDAIE Online course, and the investigator of this study. I closely monitored and collected data on each of the participants during a five-week period. The context and content of this SDAIE online course are about learning the aspects of intercultural communication while adapting to a second culture (i.e., life in the USA or Canada). The lesson content deals with problems the ESL students have in common: learning reasons for classroom culture shock and making changes they may expect when taking a Western-style course or working on a job. SDAIE methods and strategies help students learn cognitive-academic language proficiency and subject area content skills (such as math, social studies, science) in context and with native speakers in the class or on the job. The course objectives and content for this design study are based on the research questions and the three SDAIE design sub-components that create a low-risk, safe environment. Designers must remember one important aspect in regard to applying SDAIE methods and strategies: the curriculum and objectives remain the same as in designing for traditional courses. Only the methods or strategy presentation changes for the content in a SDAIE course. This difference is true of both the SDAIE F2F and online courses to make the content comprehensible.

Table 1

Components of the SDAIE Conceptual Model or Tool

SDAIE F2F	How SDAIE can be applied online
Connect to previous learning. Especially begin lessons or new content chunks with activity or strategy to connect students to what they know. Build schemas related to the lesson content. See Big Picture.	Use of checklists of what they already know. Let them opt out of modules because of previously passed off competencies. Students can click through lessons for the overview and return to parts to study.
Use lots of realia, visuals, technology, and manipulatives that help ELLs in acquiring English and also connect words to concrete life and processes. Hands-on experiences. Multiple demonstrations in different contexts. Key word support list.	Use electronic interviewing. Links to URLs for specific content info, visuals, videos, authentic language contexts. Independent and interdependent skills grow as technology skills increase in researches, games for language and strategy use.
Prepare a low-risk and safe environment. Less stressful. Use comprehensible input.	Let students take more time to compose answers online and use an alias (safer).
Use Lesson design, delivery, and learning strategies that involve learners in authentic content tasks such as methods to develop higher-level thinking and language skills.	Give students endless chances to practice with fast feedback. Computer lesson software/modules can model concepts. Computer simulations help.
Have multiple access points. Many strategies (lesson design, delivery, and learning strategies) to involve learners in authentic content tasks like methods used to develop higher-level thinking and language skills. Guided practice. Concept mapping.	Add online support or scaffolding with hyperlinked text in readings can. Computer lesson software/modules can model concepts. Computer simulations give extra edge.
Make learning cooperative and interactive. Small group work. Mentors, aides, or teachers guide. Learning companions help. Can be a problem-based instruction model. Task-focused lessons incorporate specific language objectives (L/S/R/W).	Include all students in highly interactive discussions. Cooperative group activities in asynchronous conferencing, round robins, symposia or expert panels. Web buddy, jigsaw, group problem solving, email pals. Much reading and writing.
Include chunking and webbing. Use a content-based instruction model with content modification so that ELLs know what is expected of them. Integrate smaller chunks of information. Use of graphic organizers.	Include pro-con discussions and presentations of content, articles, cases, and issues. Critical thinking activities happen in chats, threaded discussions with reflections, reactions, summarizing, tips.
Be respectful of learner as a person. Include family, cultural background into learning environment. Be patient for responses.	Use visuals, virtual characters, audio voices, acceptable colors and screen graphics, or content from cultural norms of learners.

The content for the created blended lessons focused on the following: preferred learning styles, communication styles, cultural bumps people encounter, and becoming aware of the influences of high-and low-context communication, the influence of language families on thinking patterns and how these difference matter when writing an academic paper or work report in the U.S., learning strategies, culture shock, cultural bumps (Archer, 1986), six stages of viewing cultural differences (Bennett, 2007), perspective transformation and attribution training (Furnham, 1993), and transformational learning (Mezirow & Associates, 1990). The design overview plans for the SDAIE online course are found in Table 2. I created this plan from combining my previous SDAIE course design knowledge, from lesson plans I had used to teach previous university courses, and from Merrill (2002) and Bonk & Dennen (2003, p. 344).

Table 2

Design Methods/Strategies for Use in this SDAIE Online Course

Design methods and strategies	How method is used in course	Purpose of doing this
Guides		
Use of virtual guides and learning companions who model language and behavior in social and interactive situations. Will be: human study buddy or digital voices, photos, and 3D agent heads and bodies.	Learners see and hear examples of virtual guides as models so learners may use language, think, act as natives do in real world for comprehensible input. Roles of guides: instruct, demonstrate, motivate, and introduce, conclude lessons. Humans interact with learners in assignments.	As examples, guides enable meaning and skills for learning through connections in context for content or language. Guides strengthen online socialization and different ways to communicate through the Internet.

Scaffolding		
Use scaffolding for a low affective filter (less stressful situations) so learners do not feel as alone and can practice skills in environment safer from social ridicule.	Various help methods are built into lessons, such as: tutorials, FAQs, virtual guides, glossary, instructor orientation to learning style awareness, help to learn and practice new learning strategies, predictable course structure.	Having support from people, technology, and guides is less stressful when students stretch with assistance as they move beyond the limits of their abilities to a new ZPD.
Safe Environment		
Create safe environment for interacting with access methods and technology required to navigate the course and do lessons. Familiarization with course and course policies.	Complex tasks are broken into small safe stages to do whenever students desire. All students are required to do Pinnacle's five intro tutorials: how to register for a course, use a discussion board and chat room, navigate the system, and take assessments.	For increased confidence in using the course system and less stress over technical worries, learners practice how to interact with and use the main course system elements.
Cultural Insights		
Offer insights of the invisible cross-cultural realities and differences in preferences because of high and low context cultural views and communication styles. Thus, get perceptions of less stressful lessons.	Eye opening video clips and examples are used so learners can examine their own stereotypes and get more intercultural knowledge. A few training exercises in intercultural communication and sensitivity can result in empathy for others and adapting to diverse situations.	Once students realize their high or low context views and expectations are causing frustration in situations at work or classes, they can find ways to be flexible and adjust to bicultural views.

The instantiation in the course design for the first SDAIE sub-component, guides, focused on the use of virtual and human guides in a supportive affective environment. I believe that some cultural preferences and views can be altered by mentors, teachers, online guides, learning companions, and facilitators who act as transition guides. Implementation examples of what the SDAIE component of a low risk environment looks like with guides from the online course offered places in the course design for guides to act in instructional roles. The purpose of these guides is to assist the learners to make cultural transitions and gain confidence in their abilities to express themselves. These guides included human study buddies, low-tech voices, and digital 3D characters. Guides or near peer buddies and personas help students break out of the old image they have of themselves as learners. No matter what age or level of professional expertise learners attain, they can all benefit from guides and role models.

The instantiation for the second SDAIE sub-component, scaffolding for a low affective filter in second language acquisition, came in the form of discussion boards, checklists, design details for Latino preferences, and online stars added for completed work, along with helps and tutorials.

The instantiation of the third SDAIE sub-component offered a less stressful course through initial technical training tutorials. These tutorials are on how to register for a course, use the discussion board and chat room, navigate the system, take assessments, and check a user's readiness to do online courses.

One purpose of designing opportunities where learners could use these three subcomponents in the course was to allow experiences where people can find a new comfort zone by taking on a new persona until they could feel more comfortable in situations and reach their personal goals. Some learning companions in the course were the other students in the course who join in collaborative activities to achieve desired outcomes.

Some SDAIE Online Course Themes and Objectives

One course objective was to enable learners to apply transformational steps to become increasingly bicultural and interculturally competent as they move between cultural and linguistic worlds. While working with others and the course guides to build new intercultural communication skills and views, these new experiences and perspectives enabled further transformation more easily and quickly. Because people are at different stages on the continuum of intercultural competence, they will see and react to the same situation in different ways. Examples and exercises in the course guided the learning process by which the participants were able to have their perspectives transformed. Each participant chose a cultural bump or surprising cultural situation in his or her life to examine, explore, and deal with during the month. Their reflections and actions became a part of "cultural reflectivity", which is the process of engaging in critical examination of one's own assumptions and of valid alternative ways of knowing and being. This transformation process allows one to become more aware of one's own culture through a process of a more open-minded dialogue and interaction with different cultures. Cultural introspection and awareness helps students and professionals to become increasingly sensitive to differences that exist and increasingly skilful at understanding multiple perspectives behind cultural differences they notice. Another objective and course theme was that of encouraging mutual understanding and the development of new intercultural communication skills. In this design research, I outlined how Bennett's (1993) six stages of developing intercultural competence (as shone in Table 3) would apply in the participants' lives. Each learner was to notice their reactions and thinking throughout the last week of the course to ascertain which level of intercultural competency they were experiencing.

Recognizing Levels of Cultural Competency in Life and in Instructional Design

The same content that the Hispanic/Latino participants interacted with in this SDAIE Online course, in applying process of intercultural transformation in their lives, could also be useful to instructional designers and instructors. Professionals often do not recognize what stage they are at themselves in regard to the conditions and views of cultural differences. Information in Table 3 may help everyone understand themselves and their reactions to cultural differences better. These insights can also aid in understanding the reactions of others who might be in different stages of development. In Table 3 I have adapted information from Pang (2005, pp. 138-141), from content in a lecture I attended given by C. Compton (personal communication, October 29, 2004), and my own experience in working with designers. The table may be a guide for designers who might wonder which of the six stages they could be at in the continuum of becoming interculturally sensitive designers. I offer a description of what the six stages could be like for them in dealing with cultural differences during the design process as I have adapted them from Bennett's stages. Table 3 can also be used by people who do not often realize that others are in different stages of development in intercultural adjustment, their level of cultural sensitivity, ethnocentrism, stereotyping others, racism, bigotry, or in becoming bicultural.

Table 3
Adapting Bennett's Model for Becoming Culturally Responsive Designers

Description of stages	Stages of becoming more culturally responsive designers	Representative comments and responses during stages
1. Denial: ignore some realities, feel ethnocentric, and have a belief that how life is in their cultural view is the only true view of how things should be. There is little exposure to cultural differences, and people mostly just glance at the surface.	After going to another location and culture, people who are raised in a mono-cultural environment do not realize that they are still seeing things with the same worldview as they had back home. They think everyone sees with their worldview. This can also happen while working virtually with an audience from a distance when designers assume the learners can use the technology and the lessons the same way anywhere in the world.	"What difference? This is just like what we have been doing all along. I don't see any difference." "They speak English, don't they? Our content is fine as it is, and we'll save money from doing translations." "If they got hired into our company, they must have passed the requirements to understand this and can do it just like anybody else."

2. Defensiveness: feel denigration from threats of cultural differences. Do broad negative stereotyping that is based on social categories such as race, cultural group, or age.	Seeing the world as “us” and “them.” Frustration sets in when practices in some cultures may look the same on the surface, but the learners respond differently than expected to instructions. The cultural differences people notice make them feel uncomfortable or even sick from culture shock.	“They are uncivilized and ignorant.” “He so polite that I do not know what his opinion is.” “They do not respond to my email.” “They are messy.” “My design is just fine and I’m not changing it to cater to them.” “Our way is superior. Their way is inferior.”
3. Minimization: treat cultural differences as if they do not matter. The differences are minimized and do not seem to matter much. This is a common stage where people generally get stuck and do not move on to becoming culturally sensitive.	After moving to a point of recognition where they know they should not be defensive about cultural differences people are aware of them and are defensive anyway at some level. So instead, people try to cover up the differences with looking for aspects that are similar. They focus on what is similar because they think or hope that we all experience the world in universal ways.	“We are all in this same profession. We have so much in common.” “If I wait long enough, they will begin to understand what we are doing here and see it the same way I do.” “We are all basically alike as humans.” “We are all children of God.” “We all learned to design with constructivism, so it’s fine.”
4. Acceptance: have an attitude of accepting differences in more contexts. People begin to see a continuum of complex worldviews. They do not see issues as black and white. They use more non-verbal cues.	When encountering cultural differences, people are not offended. Rather, they simply accept the differences with respect, but not more than or less than their own ways. They see others as different from themselves and the world as a more complex place to navigate.	“Well, that’s different,” designers finally realize. “Oh, how interesting! I wonder how this happens?” “I accept these differences.” “I wonder what this means to these people?” “I celebrate a chance to use brighter colors in these slides.”
5. Adaptation: develop new skills sets and empathy to use these skills according to context. This stage is more living, doing, and application by adjusting to different cultural ways than only thinking about cultural differences.	Adapting is not assimilating. Instead it is learning to see, feel, and believe as the other does in different contexts as they come along. Bennett wrote that in this stage culture is understood as a process we engage in. It often takes more than five years of living in another culture to really begin to adapt and shift thoughts and actions in authentic ways.	“This is just different, and I can do this process either way.” “Let’s shift our framework so that the learners can view this problem from several contexts.” “It will be worth it to adapt the interface so it is localized for this large segment of our audience.” “This graphic is so perfect for this, and they will relate!”
6. Integration: be exposed to so much change people are not sure of their own identity with any one culture.	When people start blending in as part of one or more cultures, they get a sense of disorientation and who they are. They use a variety of worldviews and customs.	“Don’t ask me to edit this piece. My English is not so good anymore.” “Will they even like that design if we use it?”

Bennett’s Stage 4 and stage 5 are much more preferred while persons adjust their lives and worldviews as they work from the acceptance stage between two or more cultures. In these stages, people can be seen as functioning in multicultural, intercultural, and multi-contextual frameworks as they build the bridge and are well connected in at least two directions. A common response is one of relief when learners realize that it is not necessary to remain in any given stage Learners can leave their comfort zones by reflecting on their sense of reality in the continuum of any of the six basic stages.

Findings

From the three SDAIE subcomponents that I designed into the course, the research findings revealed seven areas where applying SDAIE methods and strategies benefited the learners. I noted participant’s responses week after week during our formative evaluation interviews regarding the basic course elements, objectives, activities, concepts, and the way they were implemented in the course. It was possible to recognize the match in benefits for SDAIE Online as well. The seven areas where SDAIE Online implementation benefited participants are as follows: a) Learners experience components of low-risk and safe environment, b) Cross-cultural adaptations of course content that are appropriate for the target audience, c) Multiple representations of types of guides and learning companions, d) Components of responsive scaffolding in the course, e) Components conducive to low affect and less stress, f) components of pre-course tutorials and overviews, g) International students can understand and access academic content area.

articipants were required to reflect upon which of Bennett's six stages they probably were experiencing. They identified the benefits of their moments of transformation in adjusting to living and working in a second culture. Their new views and feelings documented some positive changes from where they had started in the course. One major issue was related to the influence of high-and low-context communication and worldviews in their lives. I documented a collective sigh of relief and new views that participants expressed after they recognized elements of this almost invisible reality. Once the learners realized their high-context views and expectations were causing frustration in low-context situations at work and in class, they found ways to be flexible and adjust more to bicultural views.

By the end of the implementation phase every participant indicated some levels of adjustments had occurred for him or her. All this change contributed to the sense of confidence and setting the learners' thinking free as evidenced by the following comments by a Mexican male during our final interview:

> I think the most important thing I got from the entire course was to find out how I'm doing in some aspects of my culture bump and about high-low context. I found out I'm conservative in my speaking. Sometimes I don't say much because I'm kind of shy. Sometimes we don't notice it. We just keep leaving it like that. This class opened my eyes and let me know I need to work on that if I want success here in this country. I got A LOT of information on the areas where I need to improve, and I got information HOW to improve. I decided I need to work harder to improve my pronunciation and make my accent less noticeable.
>
> New things for me are the stages of adjusting to cultural differences. The questionnaires help me more know more about myself, and this gives me ideas for improving. The information in this course is helping me at work. I realized that I am in three cultures and adjusting. I learn a lot about the U.S. culture from my co-workers, but I interact with my wife more than I do my co-workers. I think my wife's American culture is different because she is from a different culture. She speaks normal English, but she speaks on the phone different to her mom than she does to me. Her pronunciation is different then because she speaks Ebonics with her grandmother and mother. I don't understand it. The situation changes how I have to adapt and respond. It's kinda complex.

Conclusions

One major design objective was met in this research: SDAIE Online was instantiated, and it exists as a design instance. This exploratory design study research allowed for some useful qualitative data to be gathered; however, the sample size was small. I suggest that we can assume these results will be limited to Spanish and Portuguese speakers who live and work in the U.S. and that the results will work for those in this group who expect to live abroad here for a few years or more. Nevertheless, the seven participants' favorable responses to the SDAIE methods and strategies suggest that yes these learners received similar or some of the same benefits while participating in this SDAIE Online design instance as they would in a SDAIE F2F course. Their confident responses stands a proof of concept that SDAIE F2F methods can function in an online environment with positive results. I suggest that we can assume these results will be limited to Spanish and Portuguese speakers who live and work in the U.S. and that the results will work for those in this group who expect to live abroad here for a few years or more.

As evaluated in the formative evaluation, the course design worked well, and I have decided that I can continue to use these course pieces in future course versions. I have concluded that the participants all could do certain beneficial tasks and recognized "invisible realities" that they could not before the course. Learners did move across cultural learning boundaries. From self-reports during our final interview, learners marked their spot on the continuum of the six stages of cultural differences. They have felt they had definitely moved on beyond ethnocentrism to some point in other stages. Connected to these changes, they all selected real world problems to explore in their cultural bumps and with learning strategies. From the data and the findings these seven students learned new concepts from course content in a safe environment. They were able to take action in their personal lives, reporting enhanced confidence, a positive attitude, and improved skills in their personal and professional lives.

It takes a lifetime of effort and noticing subtleties to better act and to communicate in diverse situations. Because culture is always changing and human nature brings changes and surprises, it is fleeting to feel that we "have arrived". The development of cultural effectiveness is a life long process, should we accept this view. I believe that no one "makes it" alone or is successful alone. No matter what age or level of professional expertise we attain, we can all benefit from guides, role models, and learning companions. The cross-cultural nature of many of our courses and our efforts in global communication requires special attention because of the unintentional misconceptions in lessons that can occur during design, development, and implementation. I encourage others to identify and work through cultural bumps or disconnects as they identify the stages of intercultural competence in which they operate. As we become the leaders of the globally connected 21st Century world, may we become more elegant and effective in the way we approach our communication with others. Both leaders and the learners can be enriched by increasing their reflection time and having courage to explore other cultural views and experiences.

Future Research

This course and research are a beginning point in examining how SDAIE can be implemented online. By creating a prototype example of an online course and using it with multinational students in the USA, the design study for this research project may serve as a guide to others who look for ways to adapt design to more contexts and for multiple cultures. This research study may make it possible for SDAIE Online to be implemented into more widespread use by other designers as well. I will create more videos with various views all dealing with the same event and will expand on research with cultural bump experiences from different points of view. After refining this course and offering it commercially from an online hosting service, I will create more related courses and encourage others to create similar courses on various topics and skills. I plan to use more of the multiple cultures model (MCM) expanded by McLoughlin (1999) and Henderson (2007), a cultural contextualization of instructional design. In this model designers create resources for students to learn multiple formats that show more than one cultural viewpoint. Closely related to SDAIE, designers can use the MCM to adjust content and activities for learners who represent various cultures and view points that vary from the mainstream. “However, recognizing that instructional design cannot be culturally neutral is a first step in the process of becoming more culturally competent” (Palloff & Pratt, 2003, p. 41).

The SDAIE Online course of this research project for Hispanics and Latinos is the foundation course on a series of courses for multinational learners. I am planning to create similar courses for Koreans, Japanese, and Pacific Islanders, for example, on topics of intercultural communication and cultural awareness while adapting to life in a second culture. I hope this solution of using SDAIE as a conceptual tool for online course design will not only reduce the number of e-learning dropouts but also increase the number of students who learn to transition safely into other people’s worldviews with less stress and confusion. A new journey of transformation awaits us all.

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Characteristics of Job Corps Students Revisited

Denise Tolbert, Ph.D.

The Job Corps Program

In 2001 a study was conducted on the Job Corps program. The Job Corps Program was established by the Economic Opportunity Act of 1964 and is the major youth training and employment program authorized by the Job Training and Partnership Act (JTPA). The program is targeted at youth who are economically and educationally disadvantaged, between ages 16 and 24 with the intention of breaking the cycle of poverty and improving the economic prospects of the targeted group. The Job Corps training centers offer basic education training leading to a high school diploma or GED and vocational skills training in over 100 career areas. In addition to the skills training, many other benefits are offered. These other benefits include: work experience, counseling, health care and other support services, a small monthly living allowance, a small clothing allowance, an allowance for child support, transportation allowance, and a readjustment fund to assist in the transition to work after the program is completed. With the exception of a few sites all participants reside in dormitory settings at the training sites. Program enrollees range in age from 16 to 24.

Background

There are many programs government and private, national and local, that provide academic and vocational training. Effective means for training low-literate, low-skilled groups to enter the workforce, at even baseline levels, need to be identified so that training programs can be structured to ensure their success. The Job Corps program has a 40-year history of training this population.

The original study completed in 2000 consisted of all students who enrolled in Job Corps training programs nationally from July 1, 1996 through June 30, 1997 and investigated 5 independent variables: length of time out of school, age, gender, ethnicity and scores on the Tests of Adult Basic Education in English and math and their relationship to the dependent variables program completion and job placement. This current study re-examines the research questions from the original study.

The research questions from the original study are:

1. Does length of time out of school, age, gender, ethnicity and entry-level academic skills as measured by scores on the Tests of Adult Basic Education (TABE) in English and math discriminate between Job Corps students who complete training and Job Corps students who do not complete training?
2. Do length of time out of school, age, gender, ethnicity and entry-level academic skills as measured by scores on the Tests of Adult Basic Education (TABE) in both English and math discriminate between Job Corps students who are placed in jobs and Job Corps students who are not placed in jobs?
3. Is there a relationship between length of time out of school, age, gender, ethnicity and entry-level academic skills as measured by scores on the Tests of Adult Basic Education (TABE) in both English and math for Job Corps students who differ on training completion time?
4. Is there a relationship between the Tests of Adult Basic Education (TABE) English scores and training completion, job placement, and length of time to complete training?
5. Is there a relationship between the Tests of Adult Basic Education (TABE) math scores and training completion, job placement, and length of time to complete training?

The current study consists of all students who enrolled from July 1, 1997 to June 30, 2006 and examines the same research questions. The first two hypotheses were tested using discriminant analysis; hypotheses 3, 4 and 5 were tested using multiple linear regression.

Results

In the original study 48.8% of enrollees completed training and 85% were placed in jobs. An examination of training completion rates showed enrollees 18 years or younger had the lowest rate at 44.83%. The rate rose through the age groups to a high of 56.98% for enrollees ages 21-24. Training completion time was about one year for 98% of enrollees. Job placement rates for enrollees age 18 and younger were 69.3%; this rate rose to 74.8% for enrollees age 21-24. Performance by gender showed 49.9% of females completed training and 70.7% of them were placed in jobs. Men performed equally with 48% completing training and 71.7% were placed in jobs. Data showed that older students have a higher success level than their younger counterparts.

In 2000 training completion rates by ethnicity were: Asian Pacific Islanders 63.8%, Hispanics 51.2%; White/Caucasian 49.5%; Black 47.2%; and American Native/Alaskan Native 45.6%. Job Placement for these groups was: Asian Pacific Islanders 75.6%; White/Caucasian 75.5%; Hispanic 73.5%; Black 68.6%; and American Native/Alaskan Native 64.3%. Among the ethnic groups Asian Pacific Islanders had the highest performance rates in both training completion and job placement while American Native/Alaskan Native had the lowest. Hispanics, White/Caucasian and Blacks have quite similar performance levels.

One of the characteristics of at-risk learners is low literacy levels. This is borne out in the Test of Adult Basic Education (TABE) English results of enrollees. Scores of 500 or less equate to approximately a 1st grade literacy level. In the original study training completion rates by TABE scores were: 43.6% of enrollees who scored 500 or less; 50.5% of those who scored 500-600; and 61.6% of those who scored more than 600. Job placement rates were: 66.4% for those who scored 500 or less; 73% for those who scored 500-600; and 78.2% for those who scored more than 600. Enrollees also take a TABE in math. The training completion rates were: 43.8% of those who scored 500 or less; 53.7% of those who scored 500-600; and 65.6% for those who scored more than 600. Job placement rates were: 67% for those who scored 500 or less; 53.7% for those who scored 500-600; and 65.6% for those who scored more than 600. Despite low literacy levels, enrollees have favorable training completion and job placement rates.

Data categories in the most recent study do not mirror the original study. This is due to two factors: different data recording policies used by the Department of Labor and use of different software (SPSS vs. SAS) for analysis. In the 2000 study training completion and job placement were recorded as yes or no. In the current study these variables are reported by gender, age and ethnicity.

Training completion data by gender reveals the following: females 59.4%, males 57.4%. Breakdowns for completion by age are: 16 years or younger, 50.0%; 17-19 years, 57.5%; 20 years or older, 65.0%. Training completions by ethnicity are: American Indian or Alaskan Native, 55.3%; Asian/Native Hawaiian/Pacific Islander, 67.8%, Black or African American, 58.1%; Hispanic or Latino, 57.8; White/Caucasian, 58.5%. Results indicate differences in training completion by gender are not significant. Older students complete training at higher rates than their younger counterparts.

Further job placement data is divided between those placed in the area of vocational training or not. The percentage of females placed in jobs in the area of their vocational training is 26.2%; those placed but not in the area of vocational training is 54.1%. The percentage of men placed in jobs in the area of their vocational training is 26.8%; those placed but not in the area of vocational training is 44.8%. By age job placement in the area of vocational training is: enrollees 16 years or younger, 17.8%; 17-19 years, 26.4%; 20 years or more, 32.3%. Percentages of enrollees placed outside their area of vocational training are: 16 years or younger, 53.5%; 17-19 years, 48.2; 20 years or more, 46.0%.

Job placement by ethnicity in the area of vocational training is: American Indian or Alaskan Native, 24.6%; Asian/Native Hawaiian/Pacific Islander, 31.3%; Black or African American, 24.1%, Hispanic or Latino, 27.1%; White/Caucasian, 30.4%. Job placement outside the area of vocational training is: American Indian or Alaskan Native, 48.5%; Asian/Native Hawaiian/Pacific Islander, 50.4%; Black or African American, 50.1%; Hispanic or Latino, 50.8%; White/Caucasian, 44.2%. For all categories, gender, age and ethnicity, fewer than half are placed in jobs in the area of vocational training. These figures may be low due to the percentage of "Unknown," those whose records were incomplete. Overall 96.1% of enrollees completed training in 12-18 months.

Low literacy levels continue to be a characteristic of this group. On the TABE English test 50.7% of training completers scored less than 500; 19.8% scored 500-600; 68.7% scored 600 or more. On the TABE math test 51.5% scored less than 500; 61.3% scored 500-600; 70.9% scored 600 or more. Data for TABE scores by job placement were not reported. Literacy levels have not changed significantly between the two studies. Despite these low levels enrollees are still completing training at fairly high rates.

These results show that the Job Corps continues to be an effective program for at-risk students. Despite entering the program with low literacy levels students are able to complete training programs that lead to employment in vocational areas.

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Open Source Technology Solutions: Free Alternatives to Expensive Commercial Products

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Introduction

The term “open-source” is synonymous with words such as, “free” and “Linux”. True, “open-source” is linux-based. And “yes”, it is free. Linux-based products are designed originally for people who understand the concept of what makes Linux work. However, the producers of these products also want to gain momentum by providing both Windows and Mac versions of their “freeware” in hopes of making the public-at-large aware of alternatives to mainstream commercial applications.

Open-source has come a long way. Many of todays open-source operating systems provide technical support in some capacity. open-source applications such as the alternative to Adobe Photoshop entitled, GIMP (GNU Image Manipulation Program) are supported by the open-source community. Therefore, when one looks up tutorials on how to use a specific application, most times one will find a long list of individualized sites that can satisfy a variety of needs.

Though the focus of this paper is to shed some light on open-source applications, one cannot do so properly without a small mention of the Linux operating system.

“Hi, I'm a Mac! I'm a PC! And I'm Linux?” - Some Linux Information

The names Bill Gates and Steve Jobs can be associated to Microsoft and Macintosh respectively, but who is Linus Torvalds? Originally from Finland, this graduate from the University of Helsinki, who now calls Silicon Valley home, is considered to be the father of Linux and a hero to many.

Linux, like Windows and Mac, is an operating system, or “o/s”. An operating system establishes an environment where one can have access to a multitude of tools in order to create/produce a product (i.e.: spreadsheets, presentations, word processed documents, graphics, check emails, listen to music and web designs, just to name a few). Linux, unlike the mainstream giants, has a variety of operating systems to meet the needs of individuals with varying skill levels. Conversely, Windows provides users with several versions of its o/s with varying degrees of functionality and Mac provide its users with only one option in an operating system.

Some factors that set these operating systems apart are: 1)Linux is FREE, whereas Windows and Mac carry hefty price tags. 2) The code behind Linux itself is “open-source” and therefore can be modified and re-written (the reason behind why there are, quite literally, hundreds of various versions of Linux – each sporting a different name, look and feel). 3) A programmer with enough skill to redesign the internal coding of the operating system, which is open-source – meaning, no one individual owns it - can then turn around and make a profit. Companies such as Red Hat and Novell are currently making a profit selling their versions of the o/s as well as technical support. 4) Additional applications, such as browsers, office suites, games, graphic design software, etc., can easily be allocated throughout the open-source community. On the commercial side, there is a price tag associated to every piece of software we use. However since Linux, by design is free, it is referred or associated to the world of open-source.

A full timeline of the History of Linux can be found online at: http://www.linux.org/info/linux_timeline.html

A brief biography for Linus Torvalds can also be found online at:
http://www.linux.org/info/linus.html

Demystification

When one hears the phrase "open-source" or the word "Linux", the immediate reactions are that it sounds complicated or that there's just too much programming involved. The purest form of Linux does require a solid understanding of computer programming. One of the reasons for this is that by using what is known as typed "command lines," a user can gain direct access to a particular application without having to wait to locate the application, then for the "pretty" graphics to reveal the application, and finally for the application to open up in order to work. Although the ease of Linux and command lines may sound efficient, they pose certain challenges for individuals who want significantly more than what other operating systems can offer. For many people who are accustomed to working in a Windows or Mac environment, working in a graphic interface with point-and-click features makes the experience a sane one. The idea of having to type a command that will open some program similar to Word doesn't thrill many users. And, as if that weren't enough, a user would need to troubleshoot his/her command if an error is encountered.

The graphic interface, or Graphical User Interface (GUI), is vital in winning over users of traditional operating systems. Currently, this has become an explosive topic, but in a good way. More and more Linux-based operating systems now have a GUI for those who want to try Linux without the fear of the "command line." Such operating systems include, Mandriva, Knoppix, Fedora and the Ubuntu Family – Ubuntu, Kubuntu, Edubuntu and Xubuntu. These o/s allow users to simply point-and-click to access any application. (And "yes", there is the right-click for those Windows fans.)

Running a Linux o/s requires you to understand that the commercial or proprietary applications that would normally run on your Windows or Mac will not always run on Linux. (There is a way to do this for Windows applications, but details will not be given here simply because it is not foolproof and may cause more harm than good.) Perhaps more importantly, knowing what the alternative applications are to the commercial and proprietary products will help users to achieve a certain level of financial freedom.

Open-Source and Financial Freedom

As stated earlier, open-source applications are "freeware." These programs are produced and maintained by people from all over the world who believe that no matter what an individual's economic status is, what country someone lives in, what level of education s/he may have or may not have – everyone is entitled to have access to technology. As a result, open-source is not solely 100% for Linux. There are open-source versions of applications available to both Windows and Mac.

The equivalent to Microsoft Office (MS) is called, Open Office (OO). It is available for Linux, Windows and Mac. It's a free download from www.openoffice.org. Simply select the version for the appropriate o/s and download. Open Office contains equivalent applications to rival Microsoft. For example, OO Writer is MS Word; OO Impress is MS PowerPoint; OO Calc is MS Excel; OO Base is MS Access, and so on. Advantages to Open Office include: Microsoft Office compatibility; export to PDF almost instantly; creation of a SWF (ShockWave File) of a Presentation; files saved to earlier versions of Microsoft; files saved to WordPerfect; and many more. This article was created using Open Office Writer. Can any noticeable difference between this and a Microsoft Word document be detected?

For graphic design, the most popular commercial product on the is Adobe Photoshop. Version 10 (CS3), as of this writing, is now on the market. Adobe is now releasing new versions on a yearly basis. It is nearly impossible for anyone, organization, business or individual, to keep up with this technology in a cost effective manner. It even that much more difficult for non-profit organizations, small businesses, educational institutions, or students who either operate on a limited shoe-string budget or no budget at all to remain on the cutting edge of software like this. However, there is an open-source Photoshop equivalent called the GNU Image Manipulation Program, better known as GIMP – www.gimp.org. Like Open Office, it is available for Linux, Windows and Mac. At time of this article, GIMP is at version 2.2 and is about as powerful as Photoshop version 7. It has many of the same features, but like all new programs, it does take some time to get oriented to its interface.

If a user needed to build a website and could not find a current version of Microsoft FrontPage (Microsoft officially dropped FrontPage as of November 2006) and Adobe Dreamweaver is not within budget, NVU is an open-source option – see www.nvu.org. There is also KompoZer – www.kompozer.org - which is built on the NVU interface and the programming code used to design the application itself. As with KompoZer, an advantage of open-source is that no one individual or organization owns the code behind the application. It can be modified and renamed and put back out onto the web as a new product or as an upgrade. Another advantage is that open-source applications are available in many languages. NVU or KompoZer is a WYSIWYG (What You See is What You Get) text editor as powerful as FrontPage 2000.

Overall, what would a package containing the latest Microsoft Office Suite, Adobe Photoshop and Adobe Dreamweaver cost? Walk into any computer or office supply store and the prices range from the ludicrous to the absurd. For teachers, faculty, staff, and students, there are academic discounts from websites such as: www.academicsuperstore.com, www.journeyed.com, www.studica.com, just to name a few, but the problems begin when an institution or organization must go with the lowest bid on software from specific sites yet those prices are still over-the-top. To illustrate the open-source versus commercial costs of equivalent products, see the chart entitled "Cost of Commercial Applications vs. open-source Applications."

Whether an individual runs a P-12 classroom, or a corporate boardroom, open-source is making its way into the mainstream – and saving users money. Classrooms can now conduct courses that will keep students on the cutting edge. Companies can compete with the ever-changing digital techscape by providing high-caliber products and still remain within or below budget costs. Funds that would usually find themselves being spent on software can be utilized in other areas of an organization's infrastructure. Hence, financial freedom.

In this day and age, there comes a time when there will be a need to re-structure organizations, or downsize a company or make other sacrifices based on economic snapshots and projections. When the time comes to make decisions on upgrading existing software, the technology-using population raises a collective eyebrow and scratches their heads. Open-source can help during the transition period between software upgrades or may even substitute for the upgrade and become the permanent application of choice.

Where does Open-Source Technology fit in?

Name an industry and a need exists for open-source to fill. Regardless of budget limitations, open-source finds its market. In Hollywood, films such as Eragon, Ghost Rider, Spider-Man 3, the Pirates of the Caribbean trilogy and even the upcoming Transformers and Fantastic Four features have used 3D software to create some of the best larger-than-life scenes ever to fill the big screen. The video game industry is currently one of the industries that is also experiencing a boom, with 3D graphics bringing a new level of realism to the small screen. So, where do designers and animators go to learn to use 3D technology? Well, schools, colleges, and professional development workshops to name a few, but these can be costly for both the student as well as the training facility. Open-source solutions can help. For instance, while Maya, an industry leading 3D animation software from AutoDesk (http://usa.autodesk.com/adsk/servlet/index?siteID=123112&id=7635018), is by far the best and the most expensive - the cost is in the ballpark of $7,000.00, there are open-source alternatives. Enter – Blender! A powerful cross-platform suite of tools that allows for the creation of 3D content and offers playback. This means that there is a version for Windows, Mac and Linux. The best part of this is that it is all free to download from their website (see Blender – http://www.blender.org/). Even Hollywood films with their stellar-size budgets use open-source technology. In the case of Spider-Man 2, Blender was used to set-up the visuals (see http://www.blender.org/features-gallery/testimonials/animatics-for-motion-pictures/). Now more than ever do the industries around the world need talented individuals with 3D skills. Whether in films, video games, engineering, medical fields, corporate training, architecture, manufacturing, etc., staying on the cutting edge doesn't mean that current or up-and-coming technology professionals need to spend a lot of money on software products.

Problems Facing Academic Software

Academic software, because of its nature, is illegal to use outside of the educational environment. This software was merely intended to be used within the classroom setting. Although this software may not have any restrictions on what its capabilities are, the restrictions lie in how this software is used in producing content and for whom. If a programmer wanted to view the coding behind a piece of work, s/he may find the words "Academic

Version" embedded throughout the code. This can lead to some serious legal issues. Again, the solution, to this dilemma is open-source products.

The World at Large: Who uses Open-Source?

The industries are finding themselves facing down similar situations to the above statements. In an article published on the "Linux Insider" website, the Federal Aviation Administration (FAA) is strongly considering switching to Linux and open-source technology rather than continue with Windows-based system.

(Original article: "FAA May Choose Linux over Vista" - http://www.linuxinsider.com/story/56196.html)
(Similar story: "Can Google and Linux Topple Microsoft" -
http://technewsworld.com/story/Xi5rS5HtkYtAtW/Can-Google-and-Linux-Topple-Microsoft.xhtml)

CEO Michel Dell of Dell computers, uses the Linux o/s, "Ubuntu" and is currently selling pre-installed Linux on certain model desktop and laptops. (Press Release from Dell: "Dell Unveils Three Consumer Systems Featuring Ubuntu 7.04"-
http://www.dell.com/content/topics/global.aspx/corp/pressoffice/en/2007/2007_05_24_rr_000?c=us&l=en&s=corp)

Pushing the boundaries of open-source technology, an independently produced animated film was created entirely in Blender, entitled, "Elephants Dream". To download the [815mb] movie, visit, "Elephants Dream" website at: http://www.elephantsdream.org/ For a list of the open-source technology used in the production of this movie, please visit, http://en.wikipedia.org/wiki/Elephants_dream These are just a few of the many cases studies surrounding open-source and various industries.

Summary

Although global industries push for the latest technology, even they occasionally feel the noose around their budgets. Open-source is an alternative to the high-priced applications being put out there by manufacturing giants. Linux is open-source, but open-source can be utilized on existing Windows and Macs. With vast open-source resources, it is now very possible for anyone trying to establish themselves in the digital world to do so without "breaking the bank". Open-source is here. It's cross-platform. And most importantly, it's FREE!

Conversation analysis as a framework to design and to evaluate Computer-Supported Cooperative Learning (CSCL) Environments

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This paper describes a qualitative study conducted to understand the communication behaviors and the instructional interactions among instructors, learners, and content in CSCL environments. It also describes the extent to which the systematic analysis of online conversations can provide evidence of learning processes and learning outcomes in those environments.

Introduction

Early research on instructional communication characterized teachers as a senders; the students as receivers; the course content as the message, and the instructional media as communication channels (Heinich, Molenda & Russell , 1996). This study builds upon previous research by characterizing online conversations as instances of communication events that converge to influence and shape the instructional communication process in CSCL environments.

In the study, the target audience is composed of adult learners, and the learning paradigm within which the conversations were analyzed is constructivism. The constructs and research questions guiding the analysis were grounded in learning theory, instructional design theory, and the theories represented by various communication models. The communication behavior and interactions among participants in a distance education course with a computer-supported cooperative learning (CSCL) environment were analyzed at a "macro" and a "micro" levels.

Research questions

The research questions guiding the study are: What is the nature of the instructional communication process in constructivist distance education environments? How is it supported by computer-mediated instructional systems for adult learners?

Procedures

Unit of analysis: A course was selected following a theoretical construct sampling strategy. The selected course was designed and delivered online with WebCT, which is a virtual course environment with both synchronous and asynchronous communication tools. It provided access to the course archival data with the online discussions and conversations among the course participants.

Data collection: The various kinds of online messages created by the instructional team, guest speakers and students in both synchronous and asynchronous conversations were conceptualized as documents representing instructional interactions and communication events. Relevant information within each of the course modules was selected and transcribed according to a purposive sampling strategy (Ten Have, 1999) to obtain a wide range of types of data. To protect the identity of all the course participants, their names and affiliations were edited within all transcripts.

Data analysis: The procedures for data analysis in the study include: (a) *conversation analysis* (Ten Have, 1999) to explore the nature of the instructional communication process in a CSCL environment and (b) *content analysis* (Weber, 1990) to identify the types of interactions, cognitive processes and types of knowledge represented by the participants' discourse. The procedures for conversation analysis attempted to answer foreshadowing questions at the "macro" level, while the procedures for content analysis addressed questions at the "micro" level. To increase the credibility of the research results, two other researchers were asked to analyze and code a sample of online conversations for comparative purposes. Then, a member of the instructional team who actively participated in the course was interviewed to triangulate her perspectives with the researcher's interpretations.

Findings

The conversations in the data set were characterized as instances of instructional communication events with learning goals and specific rules guiding the participants' interactions and communication behavior. Despite the differences in terms of the instructional settings and the intended audience, the actions and discourse sequences identified in the literature as a basic framework for the analysis of face-to-face classroom discourse (Cazden, 2001; Mehan, 1985) were easily adapted and used to guide the analysis of online conversations in CSCL environments.

In the study, a single conversation had more than one discourse sequences; a discourse sequence included more than one turn by each participant; and a single turn represented one or more actions by each participant. Synchronous conversations did not promote interactions among the students; however, they provided diverse opportunities for the students to extend their understanding and to share their knowledge by interacting with several guest speakers' who participated as experts in the domain. The participants' discourse in asynchronous conversations represented much more diverse interactions among instructors and students, including interaction initiated by the students.

The students' discourse provided extensive evidence of their ability to understand, apply, analyze, and evaluate the information delivered as course content by the instructional team, which is consistent with the cognitive processes involved in the course objectives as learning goals. Several types of knowledge were also represented within the students' discourse in the data set; however, not all types of knowledge were represented in all conversations nor were all types of knowledge constructed and shared by all students.

The students' discourse was characterized as evidence of (a) *collaborative learning processes* in which the students shared their individual experiences to solve a problem or to accomplish a given task without the supervision of any instructor, or (b) *cooperative learning processes* in which the students followed specific guidelines from the instructors in forming teams to accomplish tasks defined by the instructors as well.

Implications

A better understanding of the nature of the instructional communication process in CSCL environments could serve as an opportunity to revise and refine current instructional design practices for those environments. For instance, the analysis of online conversations as cooperative teaching/learning opportunities could be part of a *formative evaluation* protocol with a focus on identifying the conversational features that converge in distance education environments. The protocol could also include the analysis of online conversations as a procedure for *summative evaluation* to identify the roles and the types of knowledge represented in the discourse of individual students in the course.

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Expert Chat with E2	Discourse Sequences
F1 >> OK, we are ready to get started. Today we welcome E2…	*O:* F1 opens a synchronous conversation in a chat room session
F1 >> First question – S1?	*I:* F1 initiates a discourse sequence by inviting one of the students to pose a question
S1 >> Have you developed an effective strategy for dealing with overload? In the article, you mentioned the possibility of using AOL IM as a possible back communication channel. Has that worked? And have you developed any strategy for when there is only one person available, as may occur during a late night shift?	*I – R:* The student responds by posing a question
E2 >> Great question	*I – R – F:* The guest speaker provides feedback on the quality of the question posed by the student before answering the question
E2 >> that's really the big question for us... E2 >> the answer is yes we have... E2 >> our solutions aren't perfect, but they're good enough for now... E2 >> When we get say, 1 or 2 or 3 chats at once, and the phone rings too, E2 >> we -- well different librarians do diff things.. E2 >> me, I handle as many as I can… E2 >> and then tell the next patrons that I'm busy and will... E2 >> have to call or email them back... E2 >> It works, and it doesn't happen so often that it makes me think it's a huge.. E2 >> problem. As you can tell, this is just like the desk... E2 >> when it's busy, you hurry up… E2 >> tell people to wait, get back to them quickly... E2 >> other methods: yes, we use AOL IM to get other staff to pick up... E2 >> Or we call the ref office and... E2 >> get a volunteer to help out during a busy afternoon.	*I – R – F – R:* After providing feedback to the student, the guest speaker answers the question
E2 >> Does that answer your question?	*I – R – F – R – P:* After answering the question, the guest speaker probes the student to confirm if the answer is consistent with her expectations
S1 >> Yes	*I – R – F – R – P – R:* The student confirms that the answer was fine
S1 >> Thank you	*I – R – F – R – P – R – A:* The student acknowledges the response to her question

Appendix A: Conversation analysis of a discourse sequence from a synchronous conversation

Expert Chat with E2	Interaction Types	Cognitive Processes	Knowledge Type
F1 >> OK, we are ready to get started. Today we welcome E2…	Instructor – Group		
F1 >> First question – S1?	Instructor – Student		
S1 >> Have you developed an effective strategy for dealing with overload? In the article, you mentioned the possibility of using AOL IM as a possible back communication channel. Has that worked? And have you developed any strategy for when there is only one person available, as may occur during a late night shift?	Student – Instructor		Conceptual knowledge
E2 >> Great question	Instructor – Student		
E2 >> that's really the big question for us...the answer is yes we have... E2 >> our solutions aren't perfect, but they're good enough for now...	Instructor – Group	Critiquing	
E2 >> When we get say, 1 or 2 or 3 chats at once, and the phone rings too, E2 >> we -- well different librarians do diff things.. E2 >> me, I handle as many as I can… E2 >> and then tell the next patrons that I'm busy and will... E2 >> have to call or email them back...	Instructor – Group	Exemplifying	Procedural knowledge
E2 >> It works…	Instructor – Group	Critiquing	
E2 >> and it doesn't happen so often that it makes me think it's a huge problem.	Instructor – Group	Inferring	
E2 >> As you can tell, this is just like the desk...	Instructor – Group	Comparing	
E2 >> when it's busy, you hurry up… E2 >> tell people to wait, get back to them quickly... E2 >> other methods: yes, we use AOL IM to get other staff to pick up... E2 >> Or we call the ref office and... E2 >> get a volunteer to help out during a busy afternoon.	Instructor – Group	Exemplifying	Procedural knowledge
E2 >> Does that answer your question?	Instructor – Student		
S1 >> Yes, thank you	Student – Instructor		

Appendix B: Content analysis of a discourse sequence from a synchronous conversation

Educating Educational Designers: The University Of Twente Case

Irene Visscher-Voerman
Wilmad Kuiper
Pløn Verhagen

Summary

How do you efficiently and effectively educate students to be academically competent and practice-oriented educational designers when they lack prior design experience? This papers provides an answer to this question by describing and discussing a four-year University program in instructional design and educational technology. The program incorporates substantive developments in the field, and uses authentic and partly technology-based approaches to teaching and learning educational design.

Introduction And Problem Statement

The basic curriculum question 'what knowledge is worth teaching' is very actual for those engaged in teaching designers. While we are changing our views on how designers work in practice, we need to reconsider the basic design models and design knowledge we are teaching (novice) designers. And there is also good reason to question whether the traditional teaching pedagogies are still sufficient to introduce novices to the field. Despite some good examples or ideas for the education of designers (c.f. Dorst & Reymen, 2004; Rieber, 2000; Rieber, Orey, & King, 2006; Schön, 1987; Rowland, Fixl & Young, 1992; Shambaugh & Magliaro, 2001; Visscher-Voerman, 1999) the attention for this topic lags behind the attention for what designers actually do. As a first and important step towards further increasing the quality of design education, it is important for educators to share their assumptions, theories, and experiences with teaching designers and to provide their answers to the afore-raised question. It is the intention of the authors of this article to share their assumptions, views and experiences with teaching (novice) designers in their program, as it may inspire other design educators.

The authors work as teachers and managers in a four-year educational design program at the University of Twente in the Netherlands, which recently celebrated its 26th anniversary. An important feature of this program is its multidisciplinary educational design orientation. This orientation was inspired by the North American tradition in the field of instructional design and educational technology, a field that encompasses the systematic analysis of learning and performance problems, and the systematic design, development, implementation, evaluation, and management of instructional and non-instructional processes to improve learning and performance in a variety of settings (Reiser & Dempsey, 2007).

Whereas there is overlap with a lot of design programs all over the world, this program has three distinct features. First, it is the only four-year design program in the Netherlands, with a 100% focus on educational science and technology. It consists of an undergraduate level (first three years of the program leading to a bachelors degree) and a graduate level (last year of the program leading to a masters degree). Whereas most students enrolling the undergraduate level are novices to the field of educational design, the graduate level designates students with a basic level of design knowledge or experience.

A second major feature of the program is its aim to educate students to be able to work in both academic settings, e.g. as design researchers, and professional contexts, e.g. as designers or as consultants.

Third, the program has a broad focus, providing theory, design perspectives, and research approaches in several educational domains (curriculum, learning and instruction, media, educational organization and management, educational measurement, and human resource development). Because of this broad focus, the term 'educational design' has been used rather than 'instructional design', as the latter evokes too much of an association with business environments (Richey, Fields, & Foxon, 2001; see also van den Akker & Kuiper, 2007).

As the basis of this program are four major design principles, e.g.:

- Design principle 1: Initiation into the academic profession as guiding pedagogical approach
- Design principle 2: The instrumental approach as leading pedagogical device, but with sufficient attention to various other main design approaches
- Design principle 3: Explicit coupling between generic and domain-specific design approaches and principles
- Design principle 4: Explicit coupling of educational design and research

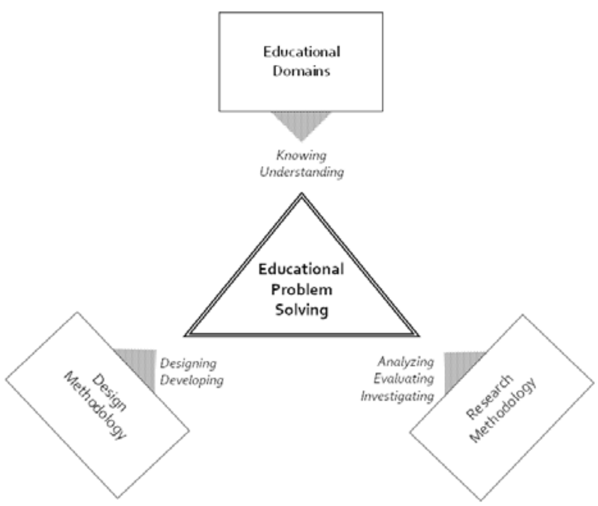
In this article, the authors will first describe the program as a kind of advanced organizer. Secondly, they will articulate the rationale and indicate why and how these design principles permeate the program, embedding them in both developments and trends in the design field and own experiences. Thirdly, the authors will provide evaluative data from a survey amongst alumni and an external university audit to sketch how this program is valued by both practitioners and academics. It is not so much meant as to proof or disproof the quality of the program, but to provide the reader with the complete picture, from curricular intentions to teaching practice to results. Fourthly, in the same line of reasoning, the authors raise several issues and bottlenecks, stemming from the program, its underlying rationale, and the experiences. The reader may be inspired to judge to what extent ideas and elaborations may be relevant for their own design teaching context.

Description Of The Bachelors And Masters Curriculum

The current bachelors program has evolved over 25 years. Although major elements have been there, the design principles have only been formulated recently.

There have been formulated 5 competence areas for the program, which stem directly from the program's focus on educational problem-solving. In order to analyze and understand educational problems students need theoretical knowledge (reflected in competence area 1: domain knowledge) and research skills (reflected in competence area 2: research competencies); in order to solve them, they need design/development and research/evaluation knowledge and skills (reflected in competence area 3: design competencies) (see Figure 1; adapted from Verhagen, 2000). To operate within the triangle theory-design-research, students require social, communicative, information technology, and reflexive skills (reflected in competence area 4: general academic and professional skills). Since many designers come to work as consultants in either the design or research area, the students also need to master advisory competencies (competence area 5).

Figure 1. Educational problem solving



These competencies apply to both the three-year bachelors program and the one-year masters program. The only difference is that in the masters program the competencies are related to one specific domain and students are expected to demonstrate a higher level of mastery, as formulated in the European 'Dublin descriptors', with respect to 'knowledge and understanding'; 'applying knowledge and understanding', 'making judgments'; 'communication'; and 'learning skills' (see Joint Quality Initiative, 2004). All competence levels get equal attention in the programs, except for the advisory competencies which are devoted less time.

Structure Of The Bachelors Curriculum

The Educational Design Management & Media (EDMM) program consists of four main components, in which several courses are clustered. In Figure 5 the structure is visualized. This is not a chronological structure, but a content-related structure where the arrows show which courses are related. The student study load of each course is being expressed in terms of European Credits (EC), with one EC equaling 28 hours of total student work. This may include attending classes, reading, group work, working on assignments, writing reports, and meeting teachers for feedback depending on the amount of independence expected from students. As such, each academic year matches 60 European credits; the full bachelors program consists of 180 EC.

The first component consists of the *foundational courses*. Here, an introduction is provided to the field of education and training; to related domains of psychology, sociology, andragogy, and pedagogy; and to one of the educational domains, human resource development. In these courses, students acquire basic terminology and create a knowledge base that they can rely on in other courses.

Second, the *design stream* consists of an introduction course and five design ateliers in combination with nine supporting courses. The first four ateliers are linked with a specific educational domain (media; curriculum and instruction; organization and management and human resource development; and evaluation and assessment). The fifth atelier fully consists of an authentic 'synthesis' design project to be conducted in groups in the domain of choice. In the course 'Educational design: Introduction' an introduction is provided to design methodology in general and to each of the specific ADDIE-phases and activities in particular. In the ateliers, students practice design techniques and methods in each of the domains with increasing complexity.

Third, students in their third year should choose several courses in a discipline different from the educational domain for a broader academic orientation. This set of courses is called the *minor* and stems from the University of Twente philosophy that attending courses in other domains develops and broadens students' academic competencies, such as communicating with professionals from other disciplines, having a broad perspective on science, and being able to master new topics relatively quickly.

Fourth, the *research stream* consists of six courses and, at the end of the third year, an individual research project. In the courses students are taught research methodology, research designs, methods of qualitative and predominantly quantitative data gathering, and statistical analysis techniques. The research assignment (more or less in a design context) requires a student to demonstrate his or her competencies as a junior researcher.

Structure Of The Masters Curriculum

In the masters program Educational Science and Technology, students narrow their specialization further in one particular educational domain. They choose one out of three different tracks: Curriculum, Instruction & Media Applications (CIMA), Educational Measurement, Evaluation, and Assessment (EMEA); or Organization Psychology and Human Resource Development (OP&HRD). The masters program is comprised of 60 EC, and can be attended full-time (one year of study) or part-time (two years of study).

Each of the masters tracks consists of three different chronological components. First, the introduction course of 5 EC provides a domain-specific overview and specifies the content areas to be taught or competencies to be developed in the track.

Second, there are two core and three elective courses of 5 EC each. The core courses explore the domain in more detail and relate to one or more of the general competencies. In the elective courses, students can broaden their knowledge and skills within either the masters track or in other tracks depending on their specific interests.

Third, the specialization phase is comprised of 30 EC. In this phase, students conduct a review of literature on research or design methodology, and on the content of their final design and/or research project. The other 20 EC are used to conduct the final project and to write the scientific thesis.

Design Principles Permeating The Bachelors And The Masters Curriculum

Now that the reader has a general picture of the structure of the program, we share the design principles that underlie this program and that helped us to focus choices with respect to content, pedagogies, assessment, etc. In this section we provide some illustrations and indicate (where possible) where they are clearly linked to each other.

Design principle 1: Initiation In The Academic Profession As Guiding Pedagogical Approach

Throughout the program, students must be prepared for the roles of academically qualified professional designer, researcher, and advisor. They are expected to acquire theoretical knowledge, to build design/development and research/evaluation knowledge, and to develop the creative ability to choose and apply a combination of those skills to fulfill design, research, and consultancy tasks in known and unknown authentic situations (see also Figure 1). In view of that and inspired by the Studio Experience at the University of Georgia (Rieber, 2000; Rieber, Orey, & King, 2006), a pedagogical approach is intended as initiation into the academic profession (Verhagen, 2000). Students are induced to develop their competencies through conducting authentic tasks, both individually and collaboratively. During all these activities, teachers assume the role of masters, showing students in words and actions how academic professionals would act. Students are increasingly expected to act as independent self-regulating and autonomous academic professionals. Therefore, the amount of one-on-one time between students and teachers gradually decreases, whereas the complexity of the assignments increases. The role of the teacher slowly shifts from instructor to coach and master. In the third year, students work on two large assignments supervised by a teacher: a design project in groups and an individual research project. The combination of these two projects constitutes the final stage of the bachelors program. The initiative is placed with the students, but teachers are very approachable with flexible schedules. In this respect it is important to realize that the financial reimbursement for teachers is the result of the quotient of the number of EC times the number of students attending the course. It is not, as is the case in many countries, related to the number of formal contact hours with students. As a result, it is easier for teachers to develop learning activities that ask for a reasonable amount of student independence and to provide flexible supervision geared to the individual or group needs. This culminates in a master-apprentice approach. Working on authentic assignments is considered the bridge between theory and practice. Students learn design skills through working on authentic assignments (mostly in groups). Assignments may include a multimedia product for an educational purpose (Atelier 1), a web quest as an application of instructional theory (Atelier 2); a written advice for organizational (re)structuring, school policy or human resource development policy (Atelier 3); or a professional project proposal and offer, as well as educational materials such as lesson series on math for autistic children or an electronic learning environment for higher education students, (Atelier 5). In the course ‘Curriculum, Instruction and Media: Practical Orientation’ practice is further intensified through cooperation with a teacher college in the neighborhood. In all these situations, students are expected to draw on theory, which is offered in the foundational courses and in the nine theoretical courses within the ateliers.

Practice comes into the program not only through authentic assignments, but also through alumni or other practitioners who incidentally function as guest lecturers (for instance, Human Resource Development Theory) or in a jury to assess student work (Atelier 3).

The concept of master-apprentice also permeates throughout the masters, but here, contact time with teachers is increased since there is only one year of study.

Design principle 2: Attention To Various Design Approaches, With The Instrumental Approach As Leading Pedagogical Device

Over years, the field has expanded to all education and training sectors manifesting itself in a rich variety of instructional or educational design theories and models for various problem types and multiple settings (see for example Andrews & Goodson, 1991; Gustafson & Branch, 2002). Some of the design models are conceptual while others are procedural (Richey, 2005). ‘Procedural’ models represent recommended ADDIE-based steps to follow in a design process. The majority of these models pertain to either large or small scale comprehensive design projects. They are, for the most part, derived from applications of general systems theory. Other procedural models like Gagné’s (1985) Events of Instruction Model, for example, address more specific aspects of the design, development, and evaluation processes. ‘Conceptual’ design models identify variables that impact the design process and show their interrelationships. An example of these types of models is the Five Domains of Instructional Technology Model (Seels & Richey, 1994).

More recently, analyses of professional design practices have shown that design approaches are much less homogenous and much more diverse than suggested in literature, due to differences in the kinds of design products to be created, design contexts, and the designer’s personal preferences and amount of experience. For instance, some designers follow the ADDIE phases successively or linearly, while others jump back and forth between different phases and/or conduct activities concurrently. Part of these differences can be traced back to the basic assumptions of designers on what is a good design and what constitutes a good design process. Acknowledging this, Visscher-Voerman and Gustafson (2004) distinguish four alternative design paradigms and underlying rationalities, instrumental or ‘planning-by-objectives’, communicative or ‘communication to reach consensus’, pragmatic or ‘interactive and repetitive try-out and revision’, and artistic or ‘creation of products based on connoisseurship’. In their study, they found designers, not only with instrumental rationality (amongst 14 interviewed professional designers) but also with a communicative rationality (7) and three designers with a pragmatic rationality.

Not only in practice can be found an increase in other approached than the instrumental one, this holds also for academic design projects. For example, amongst academic design projects in the University of Twente, we view an increase in particularly the pragmatic paradigm, as an exemplification of design research (see below) (e.g. McKenney, 2001; Nieveen, 1997; Keursten, 1994; Roes, 1997; Thijs, 1999; van den Berg;1996; Visser, 1998; Voogt, 1993).

The vast expansion of design theories, models, and approaches made us realize that these different approaches should be addressed in the program to some extent. At the same time, it has been our experience that students, being novice designers without any experience, profit most from learning to apply a sequential and structured problem-solving design approach. Therefore, it is considered important to use the instrumental approach as a basic 'pedagogical tool'. This means that students should first become familiar with the ins and outs, in theory and in practice, with this approach before moving to other approaches. The instrumental way of designing, provides novices with clear guidelines and steps for all kinds of design activities that could be conducted in a variety of design processes and contexts (Visscher-Voerman, 1999). It can also serve as a baseline against which theoretically different and innovative notions can be discussed (Self, 1997).

At the same time, however, students need to learn about and experience other less structured design approaches, such as the communicative, pragmatic, and artistic approach, to develop from a novice to a more experienced designer. During the program, they need to develop sensitivity to different design process options and become more flexible in choosing one approach. In the courses Educational design: an Introduction, the four paradigms are introduced to the students, with an emphasis on the instrumental approach. Atelier 1 asks students to apply the instrumental approach, atelier 2 guides students through a pragmatic approach, atelier 3 leans towards the communicative approach, atelier 4, again, is instrumental. In atelier 5 students are expected to deliberately choose and justify a design approach, and then reflect on its merit. However, it is our experience that students primarily and rather spontaneously apply an instrumental problem-solving approach even at the end of the program. In general, part-time students with more practical (design) experience are more able to value the different design approaches and put elements of those approaches into practice. In the masters program, the generic model is also followed, but tailored to the more domain-specific design model from the respective masters track (see also next design principle).

Design principle 3: Explicit Coupling Between Generic And Domain-specific Design Approaches And Principles

Studies of design practice have shown that design processes are highly influenced by various factors in the design context, such as the type of problem to be solved and the type of intervention to be designed. These factors have been incorporated into design-specific models (some of which have been mentioned above), and as such those models are quite helpful in addressing domain-specific accents, interests, needs, and wishes regarding design approach and interventions. Design models in the domain of educational media, for instance, provide clear guidelines for user-interface design or design of web-sites, and in doing so create a preference for pragmatic approaches. While facing the ultimate challenge of bridging the gap between policy intentions, classroom practices and student gains, curriculum developers use or might want to rely on models and approaches emphasizing iteration, formative evaluation, and deliberation. The field of human resource development concerns a range of non-training interventions like coaching programs, on-the-job learning programs, or competency profiles, and thus stresses socio-professional design activities that might be reflected in communicative approaches.

In view of helping students develop the competencies envisaged, it is considered of major importance to not only highlight the main domain-specific design models and approaches, but to also address commonalities and differences between the various domain-specific approaches, the models, and the four alternative design paradigms. Since the beginning of the program in 1981, the faculty has been organized into different departments, reflecting different educational domains. Because teachers from all departments participated in the program, input from different domains in the curriculum was guaranteed rather naturally. In the current bachelors program, there is more explicit attention for the relationship between generic and domain-specific design and these are deliberately aligned. This clearly shows in the design ateliers, which are specifically built around a certain theme, and where generic design activities are complemented with domain specific design approaches. In the first year of the course 'Educational Design: An Introduction', there is a 'professor parade'. During these sessions, six professors provide a two-hour sketch of their educational domain by illuminating specific design and research interests, themes and activities in relation to the generic model, and by explicitly focusing on the merits and shortcomings of the generic model for their domain. The masters further concentrates on domain-specific design approaches and principles.

Design Principle 4: Explicit Coupling Of Educational Design And Research

A recent development in the academic world is the emergence of and growing attention to 'design-based research' or 'design research' (van den Akker, Gravemeijer, McKenney, & Nieveen, 2006; see also Richey, Klein, & Nelson, 2004; Burkhardt & Schoenfeld, 2003; Design-Based Research Collaborative, 2003; van den Akker, 1999). Design research may be characterized as follows (van den Akker et al., 2006, p.4):

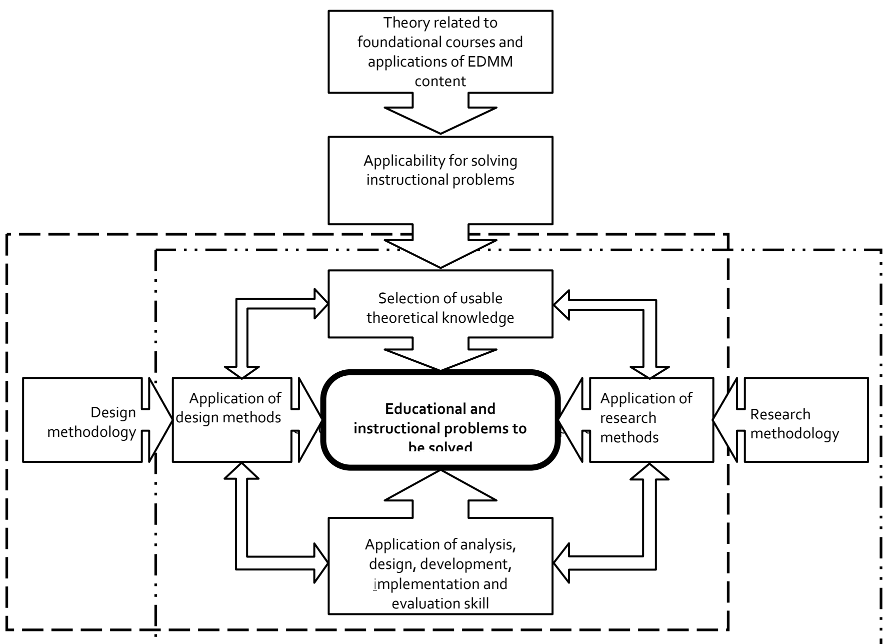
- Interventionist: the research aims at designing an intervention in the real world.
- Iterative: the research incorporates a cyclic approach of design, evaluation, and revision.
- Process-oriented: a black box model of input-output measurement is avoided; the focus is on understanding and improving interventions.
- Utility-oriented: the merit of a design is measured, in part, by its practicality for users in real settings.

- Theory-oriented: the design is (at least partly) based upon theoretical propositions; and field testing of the design contributes to theory building.

Following Barab and Squire (2004), van den Akker et al. broadly define design research as “a series of approaches, with the intent of producing new theories, artifacts, and practices that account for and potentially impact learning and teaching in naturalistic settings” (2006, p.5). They describe three motives for initiating design research: the desire to increase the relevance of research for educational policy and practice, the development of empirically grounded theories, and the aspiration to increase the robustness of design practice. Along with the pragmatic design paradigm, design-based research exemplifies the growing importance of formative evaluation during the design process.

Since its start the program has included courses on research methodology along with design methodology. Research methodology courses deal (amongst other things) with the development and use of a consistent ‘research chain of reasoning’ (cf. Krathwohl, 1998) which is the core of the so-called empirical cycle. With the growing interest in design research, what should become more manifest in the program is that the research chain of reasoning will gradually reflect academic skills that are also vital to the educational engineering processes. Design research requires the educational designer to conduct a systematic preliminary investigation of tasks, problems, and context. This includes searching for more accurate and explicit connections of that analysis with state-of-the-art knowledge from literature; formulating a guiding problem statement; reasoning logically towards a solution based on design principles derived from the preliminary investigation; and submitting the blueprint or a draft of intervention to a formative evaluation that uses the design principles as evaluation criteria. Figure 2 visualizes the analytical relatedness between research and design methodology.

Figure 2: The relatedness between research and design methodology.



In the bachelors program’s research stream, students are taught basic research methodology with a primary focus on the quantitative research paradigm, and are trained in more concrete quantitative techniques for data gathering and analysis. This culminates in the third-year research assignment, where students in the role of junior researchers are expected to conduct a small, yet well-defined part of research in their chosen design context.
The design ateliers, the third-year authentic design project, the masters course assignments, and the final masters project provide students with the ultimate opportunity to integrate research and design. For example, in Atelier 2, in line with pragmatic approaches, students are guided through an analysis phase and through three cycles of design and evaluation (screening, expert appraisal, and try-out) while developing a web quest. In Atelier 5, students are expected to hand over an evaluated design. In this respect, the approaches in the ateliers more or less have characteristics of design research (interventionist, iterative, process-oriented, utility-oriented).

The Use Of A Design Model

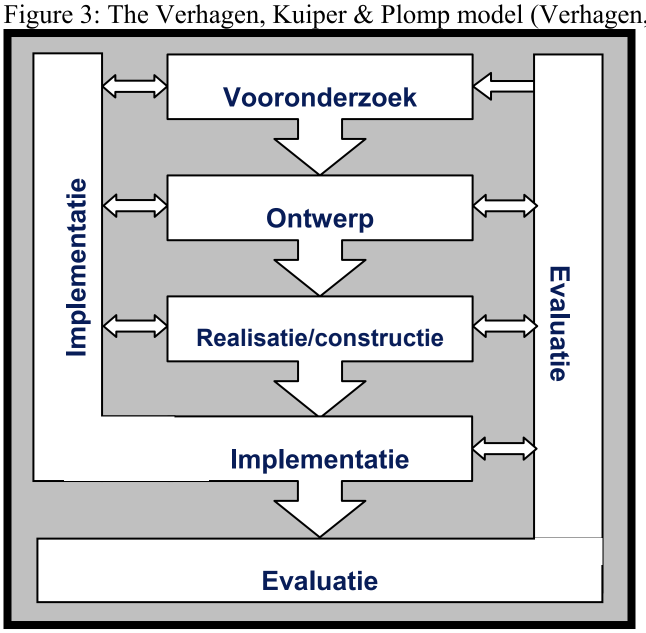
In order to meet all the design principles as elaborated before, we view it as important to use a guiding educational design model that can serve as a 'kapstok'. In the starting years of the program, we relied on a model, formulated by Plomp (1982). A typical approach of this procedural model is that an educational problem - defined as a discrepancy between 'what is' and 'what should be' - is tackled via a five-stage (ADDIE; actually: ADDEI) general procedure for problem-solving by means of a systems approach.

A validation study of this model by Pieters & Bergman (1992) showed that designers thought that the visual representation of this model was too linear and too instrumental in nature, and that it failed to embody other approaches. A remolding of this model was found imperative in order to achieve the following (Verhagen 2000):

- stress the implementation perspective more, exemplified by the motto that implementation starts in the preliminary investigation phase and should be continuously reckoned with throughout the design process;
- accentuate the role and importance of formative and summative evaluation, based on the adage proclaimed throughout the program that there cannot be analysis, design, development, and implementation without evaluation;
- represent all four alternative design paradigms and underlying rationalities distinguished by Visscher-Voerman and Gustafson (2004);
- provide room to typify models and approaches that are domain-specific.

The converted model has been called the Verhagen, Kuiper & Plomp Model and has been pictured in Figure 3.

Figure 3: The Verhagen, Kuiper & Plomp model (Verhagen, 2000).



The Quality Of The Bachelors And The Masters Curriculum

The Envisaged Quality From An Academic Perspective: The External Audit

The quality of a program - in terms of its efficiency and effectiveness - depends on how it is enacted, how it is experienced by students (in terms of learning experiences and outcomes), and how it is perceived by teachers and other stakeholders. Indications about some of these variables are available from three sources: (1) an external audit of both programs (a process that started in 2005 and was completed by the end of 2006), (2) yearly surveys among alumni about how well the alumni are doing in their professional practice and what they consider in retrospect as strengths and weaknesses of the program(s), and (3) regular course evaluations as part of the internal quality assurance policy. Here and now we confine ourselves highlighting accreditation findings.

The external audit took place within the framework of the overall transition of Dutch university education into a bachelors-masters system. Because of this, all redesigned degree programs have to be externally audited using a standard protocol and then accredited to receive funding from the national government. The protocol covers six topics: objectives of the program; content and structure of the program; deployment of staff, facilities, and provisions; internal quality assurance; and results in terms of the students' success rate and the level and quality of the qualifications achieved by the graduates. These topics are assessed via 21 facets, for each of which criteria have been formulated. The starting point is a self evaluation report, followed by on-site visits by an official Audit Committee where documents are studied and staff, students, and alumni are interviewed in group sessions. Only the qualifications 'pass' or 'fail' exist for the six topics. More distinct judgments are given for the 21 facets, however. Both the bachelors and the masters program got passes for all topics. The Committee was positive about the profile of both programs, which was recognized as clearly design-oriented in the tradition of the international domain of instructional design and technology, and well articulated in the curriculum. The level of the end qualifications of both programs were rated as good. According to the Committee, graduates describe themselves as problem solvers at an academic level. The bachelors program was judged as coherent, with the ateliers as an effective device for fostering interaction between theory and application. The masters program received some criticism, however. In the Committee's opinion the various tracks are so different that they found it hard to see them as viable options for one masters program. That being the case, the Committee judged that the various tracks offer coherent one-year programs in their specific domain that comply with the general design-oriented profile for educating academic problem solvers. Theory development and research being seen as instrumental to design processes is characteristic of this profile at the masters level. The Committee recognized that a proper balance between design and research is strived for. In the bachelors as well as the masters program sufficient attention is paid to academic reflection. It was also noticed that there exist many professional connections (via staff and assignments) with the world of business and industry and with all kinds of institutions and agencies where alumni find jobs (all yielding a clear picture of the labor market), but the goals of both programs have been developed without the systematic involvement of employers of graduates.

The Envisaged Quality From A Professional Perspective: The Alumni Survey

All students (36) who had graduated from the program between 2003 and 2004 have been sent a survey with questions in which alumni are asked to look back at the curriculum from the perspective of their current work situation. The goal was to check whether changes in the outline and content of the curriculum were necessary or regarded to be useful (Slotman & Meijer, 2005).

The response to the questionnaire was 64% (23 persons), meaning that the response group is only partially representative for the target group.

The questionnaire contains questions relating to the following themes:

- general characteristics of alumni
- education
- current work situation
- current job
- review of the curriculum
- alumni association

The results show that 95% of the alumni have found a job two years after finishing their studies, 4 of them as a PhD-student. More than 80 % of the alumni have found a job 6 months after graduation. The level and nature of the job and task description matches the educational domain for which the alumni were educated.

Respondents are satisfied about the preparation of their studies to their current job. They indicated to choose the same studies again as preparation for their current job.

Discussion

Above, we have shared the ins and outs of our educational design program, in which we aim at educating academically qualified problem solvers who are competent to work in a variety of professional settings. In closing, we reflect on five issues that have gotten attention and that will continue to deserve particular attention: the level of academic competence achieved by graduates, the orientation on professional practice, the role of reflection across the program, the attention to be devoted to the instrumental design approach versus other approaches, and the relationship between design and research.

Level Of Academic Competence Achieved By Graduates

Although the Audit Committee came to the reassuring conclusion that graduates qualify themselves as academic problem solvers and that masters theses are of good quality, the one-year-length of the masters program is a source of concern. Students who enroll the program have different backgrounds, they can be EDMM graduates, graduates from bachelors programs other than EDMM such as professional bachelors who graduated from a Netherlands teacher education institute (with or without working experience) and academic bachelors from abroad (Africa, for instance). It is our experience that many of the enrolling professional bachelors have difficulty in attaining the academic level required within the space of only one year. They simply need more time to master design and research competencies with sufficient academic depth even if they invested in a pre-masters program to qualify for the masters year. This problem of dealing with students with diverse academic skills and attitudes within a short time frame has also been recognized by the Audit Committee. According to the Committee, the best (though probably politically unfeasible) solution to the problem would be to prolong the masters program by one year. Another possibility, in addition to maintaining a strict admission policy, could be to stimulate students to primarily focus on competencies they need to work on in view of the end qualifications to be attained. Such a competence-based approach begins with students' talents, accepting that someone cannot be good at everything. It also entails flexibility in contents, pedagogical approach, and assessment modes. Such a competence-based approach, however, requires a change in teaching practices and, much harder to realize, teachers' beliefs.

Orientation On Professional Practice

The clear focus in the program on professional practices has been exemplified in several authentic learning assignments to be conducted for and in interaction with professional clients. Students highly appreciate and value this (according to regular course evaluations) and the many professional connections they made did not go unnoticed by the Audit Committee. During the assignments, the role models are provided by staff, which consists of primarily academic thinkers and designers. However, what is missing in the program is not only a more systematic involvement of future employers in further developing program goals (see external audit), but also a more prominent role of professional designers in design courses (in addition to the already existing involvement of professional clients and the already existing focus on professional settings). The latter could be realized, for example, by inviting alumni to be guest lecturers, act as role models in design situations, or to provide insight into possible design shortcuts. Thus, they could be an encouragement to students during their development from novice to experienced designer.

Role Of Reflection

A large aspect of the academic attitude is revealed in its considerable emphasis on reflection. Compared to the instructional design competencies for professional designers as formulated by Richey, Fields and Foxon (2001), the component of reflection seems to be more prominent in our curriculum. We regard reflection as an opportunity to not only optimally shape a situation and pre-consider design solutions (Richey, Fields & Foxon, 2001), but to also make designers become aware of their own individual strengths, shortcomings, interests, and basic assumptions. The ability to reflect grants a person lifelong learning and is one of the Dublin descriptors (Joint Quality Initiative, 2004). However, reflection is still too underexposed, especially in the bachelors program even though its importance is acknowledged and its merits are recognized. Students are required to prepare two so called 'reflection papers' (as part of both the first-year introduction course on educational design methodology and the second-year Atelier 3 course) and to elaborate a reflection section on part of the design report on the third-year Atelier 5 design assignment, but the primary focus is on reflection-on-action rather than reflection-in-action (Schön, 1983). In addition, the reflections made are more self-evaluative than reflective. This is possibly due to the fact that it is only in the third year that students are taught and coached on how to reflect. As a solution to this shortcoming, the program has recently decided to pay more attention to the acquisition of reflection-on-action techniques in the first year of the program (from 2007-2008 onwards), and to stimulate the use of reflection-in-action techniques while working on design assignments in the five ateliers.

Instrumental Approach Versus Other Educational Design Approaches

As stated above, we have chosen to use the instrumental approach as the leading pedagogical device. It is our experience that students who already have some design experience are better able to value the various design approaches (instrumental, communicative, pragmatic, and artistic). It is interesting to explore why this could be the case, and how we could incorporate that into our curriculum. One possibility is that these students already have a broader repertoire or a higher level of expertise (as suggested by Jones & Richey, 2000), which enables them to understand and value the different models more quickly and thoroughly. It might also mean that the way we teach the communicative, pragmatic, or artistic approach should be changed or intensified. After all, it is still possible that our current teaching does not connect to the level of expertise of the novice designer (Dorst & Reymen, 2004). In the current program, the four design paradigms and accompanying approaches are introduced through readings and lectures at the very start of the program, and students are supposed to refer to these approaches in their reflections throughout the program. However, it could be more effective to request students to deliberately think or work as a designer from a specific approach (in authentic assignments or in studio assignments, for example) and then ask them to compare their experiences with this approach to experiences with the instrumental approach. Another option could be to introduce design approaches other than the instrumental approach later in the program when students have really mastered the instrumental approach. From a pedagogical point of view, it might then be easier for them to value and interpret the different approaches. Iets meer beschrijven als een interessant onderwerp voor toekomstig onderzoek.

Relationship Between Design And Research

The research courses delivered in the program expose the students to traditional research methods with a relatively large time investment in elements of quantitative research such as quantitative data gathering methods (surveys) and analysis (SPSS). This is motivated by the fact that students consider these subjects rather difficult to master. At the same time, we experience that students have difficulties in recognizing the relevance of the research approaches that are taught to them for design activities. One reason is that research methodology courses and design methodology courses are still more or less separated streams in the curriculum. There is especially room for improvement at the bachelors level as far as the link between research and design methodology is concerned. Improvements to be seriously considered are twofold. First, for students it still should be made more manifest that the research chain of reasoning also reflects academic skills that are vital to educational engineering processes. This idea has been formulated as a redesign principle in the above, but still deserves further attention. Second, more attention is needed in both programs for the concept and methodology of research-based educational engineering (van den Akker & Kuiper, 2007).

In this article, we have shared the ins and outs of our educational design program, in which we aim at preparing students to work as academic or practitioner in the field of educational design and technology. The Audit Committee has provided evidence that the current bachelors and masters programs are of high quality. They are well-balanced, and consistent with the redesign principles. Through the programs, students do indeed develop into academically qualified problem solvers who are competent to work in a variety of professional settings. The critical remarks made in the above final paragraphs are just meant to illustrate that we take our job as designers and teachers of the program very seriously, and are constantly striving for the further improvement of program quality.

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Teaching Systematic Reflection To Novice Educational Designers

Irene Visscher-Voerman & Henk Procee

Summary

How to help students in the field of instructional design and educational technology to develop their professional expertise through systematic reflection? This question is answered by describing the intended, implemented and attained curriculum of a third year university bachelor course on systematic reflection for design students. In this course, students learn four modes of reflection that originate in the work of the philosopher Kant. This approach is perceived as a different, yet productive addition to existing reflection approaches.

Introduction

Reflection is an important competency for designers in general (e.g. Schön, 1983) and for instructional or educational designers in particular (e.g. Rowland, 1993). Moreover, in the process towards formulating instructional design competencies, expert designers viewed reflection as an "essential element of successful design for all designers, novice and expert" (Richey, Fields, & Foxon, 2000, p.72). Since it is such an important competency, reflection should be a clear component in the education of designers (e.g. Rowland, Fixl & Young, 1992; Shambaugh & Magliaro, 2001).

Reflection can be regarded as an element of academic competence. Therefore, in higher and university education, teachers regularly ask students to reflect on their work (e.g. Boud & Walker, 1998; Boud, Keogh & Walker, 1985; Korthagen & Vasalos, 2002). In a number of cases, teachers provide guiding questions to steer the students' reflection. These guiding questions frequently are based on a logic of improvement: What was wrong in your project, what are the causes of it, how can you learn to do it better a next time? In line with these questions, however, more than occasionally the student papers turn out to be rather an expression of a negative self-evaluation, than of real reflection. Not only can this approach be demotivating since students need to start with the idea 'I did not do my work well', but it also leads to superficial professional and academic growth, resulting in a mastery of explaining their failures in terms of external circumstances, and at best to only technical clues for how to improve their work. Some teachers might approve this as good reflective work, others will not. It thus shows that the concept of reflection is vague, meaning different things for different persons, and that students have difficulty in doing it.

This observation has resulted in a collaborative endeavor of a philosopher and an ID expert , being the authors of this paper, to develop a distinct course on systematic reflection for students in the field of instructional design and educational technology at the University of Twente. In this course, students, who are in the third year of their study, learn four modes of reflection that originate in the work of the philosopher Kant. The course has been taught to 7 groups of students since 2002-2003. The student study load for this course is 5 European Credits, equaling 140 hours.

The basic question underlying course design and delivery has been: *How to help students in the field of instructional design and educational technology to develop their professional expertise through systematic reflection?*

The purpose of this paper is to provide an answer to this question by describing the intended, implemented and attained curriculum (Goodlad, 1984; van den Akker, 2003). The first section of this paper is therefore devoted to our views on the nature of reflection and how to teach it (the intended curriculum), a description of the course as it is implemented (the implemented curriculum), and an overview of student perceptions and results (attained curriculum).

From the beginning we took a design research perspective (Nieveen, McKenney & van den Akker, 2006) in the sense that we:

- expressed and described a conceptual framework, based on literature review that portrays our perspectives on reflection and on teaching reflection;
- conducted an iterative course planning, in the sense that evaluation results of a course in one period led to revisions of the course in the next period;
- systematically documented and reflected upon the process and its outcomes, in order to support retrospective analysis. As such, for each course we rely on the following documents: course syllabus, author(s)' articles, electronic learning system, teacher planning sheets and log files, e-mails between teachers and between teachers and students, course evaluations –both smile sheets and in-depth evaluations- by students, student papers,

written feedback on student papers by teachers and students, student grades, and external audit statements on the quality of the course.

In the second part of this paper, we will describe these sources and explain how the design research perspective supports our work. An explanation of the methodology and evolvement of the course are followed by a discussion of the findings and future implications of our work.

Part 1: The Curricular Representations Of The Systematic Reflection Course

The systematic reflection course will be described at different curricular levels. First, the basic assumptions and views underlying the course will be formulated as the intended curriculum. Second, the section on the implemented curriculum will describe how the course is being organized and implemented. Third, in the section on the attained curriculum, we describe students perceptions of the course, and describe their development in the reflective competence.

The Intended Curriculum

The Nature Of Reflection

According to John Dewey (1916, 1933), by many authors perceived as the founding father of reflection in education, reflection starts with experience, not with theory. "An ounce of experience is better than a ton of theory, simply because it is only in experience that any theory has viral and verifiable significance" (Dewey, 1916, p. 44). Dewey distinguishes between two types of experience. The first is trial and error, leading to rules of thumb without insights into acting and outcomes. The other is reflective experience, meant to get insights into relations between causes and effects both in theory and in acting. Dewey's model for reflective experience can be viewed as a circle, consisting of the steps: sense of a problem, the observation of conditions, the formation and rational elaboration of a suggested hypothesis, and the active experimental testing. This approach to reflection can be characterized as a process in which the student acts as a problem solver (or in a metaphor: as an engineer) and grows through learning from his or her own mistakes.

One key characteristic of Dewey's model, and a lot of models stemming from this tradition, is that it is aimed at improvement. Although the wish to improve one's performance is instrumental to professional growth, this approach has, as already said, a serious drawback: the learner must take a negative view towards his or her previous experiences. As such, reflection has the nature of a (negative) self evaluation ('I did not do well'), often resulting in excuses and good intentions ('I will do better next time'). Also, students often stick to giving explanations of why something did not go well. This way, they do hardly get any new and deeper insights.

As described in previous publications (Procee, 2006a; Procee, 2006b) an in-depth study of the work of the philosopher Kant (1787, 1956) results in another, more fruitful view on reflection. Rather than a focus on improvement, it emphasizes the making of discoveries. Kant distinguishes between understanding ('Verstand'), judgment ('Urteilskraft'), and experience. On the one hand, there is the experience, something the individual has done or encountered. On the other hand, there is understanding, which is related to the ability to grasp logical, theoretical, and conceptual rules; in-between, there is judgment, which is related to the ability to connect experiences with rules. Folllowing Kant, there can be posed two assertions:

- Learning formal knowledge should be characterized in terms of understanding.
- Exercising reflection has to be characterized primarily in terms of Kant's notion of judgment.

Following these assertions, the character of reflection radically differs from the character of learning formal knowledge. Because judgment (as the capacity to combine heterogeneous elements) is situated between experiences and understanding (concepts), reflection activities depend on the breadth of the experiences, as well as on the feasibility and productivity of the concepts introduced for inquiry into those experiences. This mirrors Kant's famous dictum: 'Concepts without experience are empty, experiences without concepts are blind'. In the process of reflection, concepts have a double function; they function as a source of inspiration to analyze the experience and as an outcome in which they are better understood than before (Procee, 2006a). According to this approach reflection is not submitted to the logic of improvement, but to an emotionally more neutral logic: the logic of making discoveries.

As argued by Procee (2002) Kant's table of moments of thought, as developed in his Critique of Pure Reason, can be usefully adapted and developed for a systematic approach to reflection. Kant's four moments are:

- Quantity: this moment creates a reflective space that stimulates learning discoveries. It generates new and unexpected views on experience.
- Quality: refers to points of view that may be helpful to estimate (elements of) experiences and choices made.
- Relation: this moment brings about dynamic elements by introducing points of view that are related to different visions from a professional as well as a social context.
- Modality: this refers to the status of the judgment, in our view, it reflects on the reflection process itself and on aspects of (professional) identity.

In order to make these modes of reflection communicable, we introduced geometrical names; point reflection (quantity); line reflection (quality), triangle reflection (relation); circle reflection (modality) (see Procee & Visscher-Voerman, 2004; see table 1).

In the following sections, the general structure and aspects of the four reflection modes are described. Step-to-step approaches of each mode will be described in a later section, where the content of the course events are being described.

Table 1: Reflection modes after Kants moments of thought

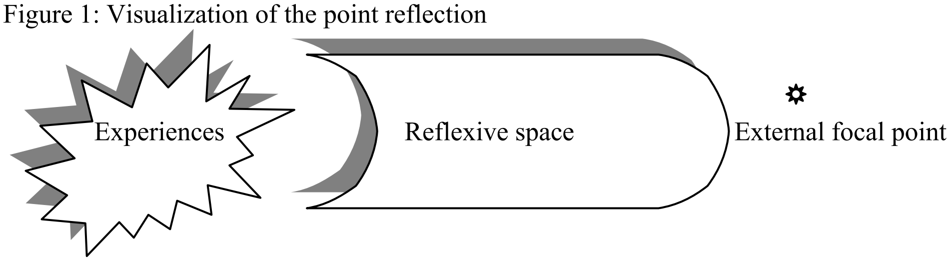
Kant's moments of thought	Type of reflection	Geometrical figure
Quantity	Point	•
Quality	Line	——
Relation	Triangle	△
Modality	Circle	❍

Point Reflection

Underlying this mode of reflection is the acceptance that an experience should not be seen as an unequivocal fact, but that it may be described in many different ways. By the 'free play of imagination' it is possible to highlight unique features. Therefore, it is important to take the experiences to a new reflexive space outside the own experience, in which new thinking activities can take place. In the reflexive space all kinds of discoveries can be made, for example with respect to the use of materials ('what is the function of different materials'), personal feelings (what in the project made me happy, what made other people happy), or a color (green: 'where did I appear to be a greenhorn?' 'What was fresh and new in our approach?'). The point reflection is visualized in figure 1. The choice for the external reference point depends on the pragmatic question: do I expect to learn from this? But one should be careful: each question will highlight different aspects in the experience, and some questions are more meaningful than others. Choosing a topic close to the experience will not add to deep reflection. For example the question 'how was the communication with the client?' will lead to a chronological description of what has been done, with little room for new viewing points. On the other hand, viewing points far from the experience may raise so many new questions, that it results in chaos. For example, the topic 'design vision' may lead to reflections on this vision itself, on parts of the vision, on other design visions, on how the vision permeates the product, etc. There are than too many questions, so that the link to the direct experience disappears.

Apart from the viewing point chosen, the quality of the reflection also depends on the type of questions that are being raised. 'Why' questions can better be avoided, since they provoke a justification for actions, as if the experience itself was wrong, which may strengthen the negative feelings of the student about the performing of his or her task. Questions such as 'how' and 'what' are better, because they put less pressure on the reflecting person.

Figure 1: Visualization of the point reflection



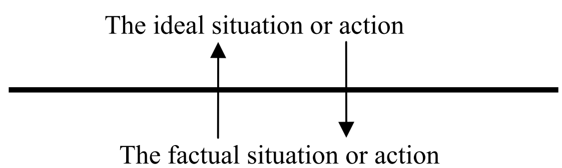
In this stage the role of the reflection partner is precarious. Such a partner has to be involved in the learning process of the student, and less in the aims of the design project itself. Reflecting with colleagues who have been working on the same project has some disadvantages, because they share the similar experience. Reflecting with one self, although being a real human capacity, is even more difficult. To create a model of the reflection partner (and also of the teachers involved in these reflection processes) a novel of the Swiss author Max Frisch is very helpful. In the novel *Mein Name sei Gantenbein*, Frisch (1964) describes a man who is thinking about living as a blind person. He is curious to know what could be his most adequate vocation. In a great passage he concludes that the role of tour guide would be most appropriate. Suppose, you are seated at the foot of the Acropolis and your group of tourists have to explain you what they have witnessed. In that case they will observe many times better than in situations in which the tour guide is a seeing person. This image – the blind tour guide – is the bench-mark of the reflection partner. It is a person who does not tell his or her own interpretations and narratives, but who inspires other persons to tell their experiences in depth.

Line Reflection

Line reflection is about quality. It borrows its name, and partly its structure, from the philosopher Plato. Plato discriminates between the factual reality and our usual experiences on the one hand, and eternal criteria in the world of Truth, Goodness, and Beauty on the other hand.

Thus, people have different views of quality; they can qualify a situation or action as ‘good’ or ‘bad’, and are able to indicate why they do or do not appreciate it. In their minds, they have a view of the ideal or perfect situation or action, against which they mirror the situation or reflection at hand. These views may change over years, based on new experiences and new insights. Also, one vision or norm could be more fruitful than others. In this type of reflection, experiences are judged against own norms and criteria (see figure 2). But, proposed criteria, norms, and ideals also have to be examined on their appropriateness. For that reason, this kind of reflection differs in some important aspects from evaluation. It does not accept criteria as given from the outside. It starts, instead, with a procedure in which one defines and scrutinizes his personal criteria in view of his learning process. Also, based on the reflection, personal norms and criteria may be adapted.

Figure 2: Visualization of the line reflection



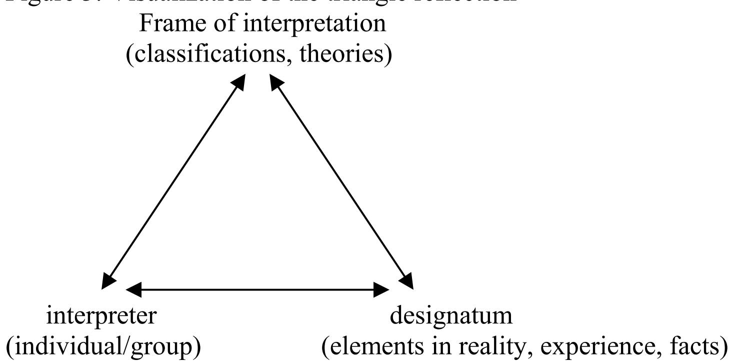
Triangle Reflection

Triangle reflection is the most dynamic form of reflection. It is based on the theory of semiotics put forward by Charles Morris (1938). In the triangle reflection, relations and connections are put central. People interpret facts or events in a certain way (for example against the norms as described in the line reflection), depending on their experiences and knowledge. For example, in traffic a red light is a sign to stop, a green light is a sign to drive. In such daily structures, there are three elements connected: the experience or fact (sign or designatum), the person(s) who give(s) meaning to the sign (interpreter), and the frame of interpretation (classifications, theories) from which meaning is derived. This can be visualized in a triangle (see figure 3).

Different interpreters may interpret the designatum in different ways, depending on their own frame of reference, and based on that, they may come to different actions. An interpreter can be an individual, but also a social group (cultural group, professional group, religious groups, scientific groups, etc). Such groups have their own frame of reference according to which they describe and explain reality.

Characteristic for this model is its dynamic structure. A change at one angle does have repercussions for the other angles. A change in the frame of interpretation (for example: the alteration from ‘smoking is fine’ to ‘smoking is bad’) does change situations in reality (special smoking places) and also creates a different image of persons (a smoker nowadays is an irresponsible creature). In a similar way, a change in reality, especially technical artifacts such as mobile telephones, redefines the social community (users and non-users), as well as the frame of interpretation about ‘normal’ communication.

Figure 3: Visualization of the triangle reflection



Circle Reflection

According to Kant the moment of 'modality' has a weaker position than the other moments, because it is about the way of thinking itself. In his words: 'The modality of judgments is a quite peculiar function. Its distinguishing characteristic is that it contributes nothing to the content of the judgment (for, besides quantity, quality, and relation, there is nothing that constitutes the content of a judgment).' (Kant, CPR, B99, 100). For that reason, we interpret this moment as the cyclical character of reflection itself. Reflection starts with experience, detaches itself from it, examines a variety of quality aspects in it, scrutinizes different types of relations, and eventuates in a growing capacity to handle new experiences. This is a never-ending cyclical process which can be put forward on the three other reflection techniques. Circle reflection can be performed on different levels:

- the design project or the design experience (what reflection method did I use to study the design experience? What new and unanswered questions with respect to design issues do I need to investigate further?)
- the professional identity (how does my professional identity fit to my personality? What is in my professional toolbox and what is lacking? What types of design problems do fit my professional identity?)
- the reflection itself (what types of reflection did help me to gain new insights? What reflection methods do I need to study more?)

How To Teach Reflection

Also from Kant, we derived three basic assumptions about the pedagogical role of the teacher, which are central in our approach. Firstly, in judgment-oriented educational settings, such as in case of reflection, the individual student and his/her learning goals is central. It asks that students take on an autonomous attitude and teachers a coaching attitude. In an environment where students are used to teachers taking the lead, this means a radical change. It asks for an explicitly active rather than passive role of the student. It is the task of the coaching teacher to improve the emotional trust and self-confidence of students to take the lead.

Secondly, judgment is related to the individual. Thus, reflection is an individual activity, in which the one who reflects takes the lead. Teachers facilitate reflection, but should not judge the experience of the learner, since that provides the materials to reflect upon. The student judges his or her own learning experiences in reflection activities, but they also judge their personal and professional growth through the reflective activities themselves. In the course, this shows in students making a justified suggestion for their own grades.

Thirdly, teachers do not instruct specific content, but put instead the reflection competence central. Students choose themes or topics from their design experience that may result in further personal and professional development. Teachers provide new viewing points or help students find these, to steer their reflective actions.

The Implemented Curriculum

In the course Systematic Reflection, we have incorporated the above mentioned principles. Students learn how to reflect, deeper than just common sense thinking, aimed at their own professional development. In this process, we follow a Kantian approach. As teachers we act as coaches. We facilitate the reflection process, while leaving the judgment of the experience to the students. As content for the course, students take their own design experience from a design project that they recently finished. In this project, atelier 5 (see also Visscher-Voerman, Kuiper & Verhagen, paper, this AECT), students work in groups of three or four students for an external client, e.g. a school principal or school teacher, a museum, a manager in a company, a teacher trainer, etc.

Below, we will describe the course, addressing the elements from the curricular spiderweb (van den Akker, 2003), and provide step-by-step approaches for each of the reflection modes in the subsection content.

Goals

The following goals have been formulated for the course. The student demonstrates that:
- He/she has made an intellectual growth in reflection throughout the course;
- He/she is able to apply the modes of reflection correctly;
- He/she is able to apply reflection tools, partly with using literature, with the function of gaining new insights regarding his/her own functioning as a professional
- He/she is able to support peers in their reflection processes by providing concrete and supporting feedback.

Course Outline

Course moments have been centered around the four reflection modes. Each reflection mode follows the same structure:
- Two-hour tutorial in which the reflection mode is introduced and a systematic step-by-step approach is being provided; instruction of the steps is alternated with small exercises, or teacher role play.
- Students write a reflection paper according to this specific mode, starting from an individual relevant viewing-point, and relating it to their own specific design experience.
- Both teachers and two peer students provide individual written feedback, sent to the students by mail, in advance to the feedback session.
- Two-hour feedback session, in which teachers provide overall feedback on the reflections, for example, by addressing topics that students chose to reflect on; by identifying pitfalls for reflection in the specific mode; by making suggestions for how to make the reflections in the specific mode more powerful, etc.
- Students use the peer and teacher feedback to improve their papers into the final paper which is being assessed and discussed in an individual oral conversation with the teachers. This oral conversation replaces the last feedback session related to the circle reflection.
- One element in this conversation is a student's proposal for grading his or her own work.

Course Content

The Tutorial On Point Reflection
This meeting addresses the questions:
- What is reflection, and why is it important?
- What are characteristics of good questions?
- What is the structure of the point reflection?
- How do you choose external points of view to start the reflection from?
- How can you help others to reflect as a reflection partner?

The step-by-step approach of the point reflection is:
1. Reflection can be initiated by using many different viewing points, for example, theoretical concepts, contradictions, proverbs and sayings, colors, emotions, tools, sports/games, 'faith, hope, and love', title of a roman, etc. Picking such a viewing point rather than project related words (such a goal, communication, instructional strategies) helps to come loose from one's usual patterns.
2. Open up your creativity by generating questions related to different viewing-points chosen from the list above.
3. Choose a viewing point, that highlights your experiences in new ways, and that seems a powerful vehicle for learning;
4. Reflect, not on a viewing point in the experience, but from a viewing point. Avoid raising 'why-questions, but concentrate on 'how' and 'what' questions.
5. Summarize what you learned.

In the tutorial teachers make an inventory of student former reflection experiences; students conduct a reflective conversation in pairs; we read aloud a Fairy tale *Spirit in the bottle* to illustrate what reflection is (http://www.pitt.edu/~dash/grimm099.html); We practice the first two steps of the step-by-step approach. Also, the theory of reflection, according to Kant is instructed. As home work students are asked to generate at least 5 questions from 3 viewing points and typify project situations.

The Tutorial On Line Reflection

The guiding questions for the tutorial on line reflection are:
- What is the structure of line reflection?
- What are the similarities and differences between line reflection and evaluation?
- After the tutorial, students are expected to be able to write a line reflection.

The step-by-step approach for the line reflection has three different phases. In the first phase, as preparation, norms and quality criteria are being formulated. The second phase consists of the reflection itself. In the third phase, the student discussed the consequences, either being related to planned adjustment of acting and performance, or adjustments of the norms themselves.
1. Choose a professional role (for example, teacher, designer, researcher, or advisor).
2. Distinguish between actor, process and product (for example: designer, design process and designed product)
3. Formulate for each of them norms or quality criteria, starting from questions such as: 'What are characteristics of a good designer?' 'What are criteria for a good design process'? 'When are you satisfied about the product?'. List these norms in a scheme (see an example below).
4. Choose one of the norms, guided by your intention to get important learning experiences.
5. Develop this norm further into norms of quality, first based on your own ideas, expectations, and experiences; and then by making use of literature.
6. Relate these norms to your own experience.
7. Summarize what you learned, both with respect to schemes for changing performance and acting and to adjustments of norms.

A good designer …	A good design process …	A good product …
Is a good listener Is creative Applies design models Knows the context Can motivate people Is a good project manager Is analytical …..	Is based on scientific knowledge Relies on users Makes use of formative evaluation Has an implementation perspective …..	Meets the specifications Is accepted by the client Is accepted by users Yields learning effects Helps to solve the original problem …..

During a first brainstorm there will not be a direct horizontal link between the columns. This might be reached in a further refinement of the scheme.

The process of line reflection resembles the process of evaluation, but is basically different on several aspects. Firstly, because the student himself determines what norms to study, secondly because its goal is to learn and not to judge. Thirdly, the norms are not viewed as a given, but are investigated on their quality. Also, not only the quality of the final product is put central, as is usually the case in evaluation, but also that of the design process, and especially the actor himself.

After a short introduction to the line reflection, we practice with the group steps 1 to 4, by focusing on the role of researcher; In pairs, students practice step 5; Students exercise difference between line reflection and evaluation, by generating 5 questions stemming from that norm that have a reflective nature, and 5 questions with an evaluative nature. As home work, students are asked to write a line reflection paper, starting from a norm that is interesting from their individual point of view, from 6-8 pages. They are expected to use literature to specify their norms and/or to support their summary of what they have learned.

The Tutorial On Triangle Reflection

The goal of this session is to make students familiar with two types of triangle reflection, related to stakeholder analysis, and to scientific approaches. The step-by-step approach related to stakeholder analysis is:
1. Choose a theme, fact, or situation for the reflection (designatum)

2. List all (groups of) ‘interpreters’ related to your design project in general;
3. Delete all interpreters from your list, that are not worthy for your chosen theme. You end up with a list of stakeholders.
4. Formulate hypotheses about the frames of reference for each (group of) interpreter(s);
5. Test your hypotheses (not always possible)
6. Interpret design experiences in relation to these differences
7. Analyze how to deal with differences in frames of reference (what strategies are possible, do fit your experiences and person, what tools do you need for that)
8. Summarize what you have learned.

The step-by-step approach related to scientific approaches is:

1. Choose a theme, fact, or situation for the reflection (designatum)
2. choose one or more different theories about that theme, for example, design theories, instructional theories, communication theories, etc)
3. Formulate hypotheses: describe from the point of view of each theory how the chosen theme was present in your project, or should have been present;
4. Interpret your design experiences in relation to these hypotheses and theories;
5. Analyze how to deal with the differences between the theoretical frames of reference (what strategies are possible, which ones do fit your experiences and person, what tools do you need for that);
6. Summarize what you have learned.

In the tutorial, first both step-by-step approach is explained. Then, we practice the stakeholder approach steps 2-4 related to the theme of quality of the product. Then, with the whole group, we practice the approach related to scientific approaches, starting from instrumental, communicative, pragmatic design approach (Visscher-Voerman & Gustafson, 2004). As homework, students are asked to write a triangle reflection for one of both options, 6-8 pages, use of theory.

The Tutorial On Circle Reflection

As a preparation for the course, each student reviews his work as done in the course thus far and makes a (small) list of topic(s) he/she wants to study during the circle reflection. For the circle reflection we do not present a clear step-by-step approach. Instead, we discuss the table as presented in table 3. The scheme is an instrument to visualize how one can reflect on different levels, ranging from the evaluative level to a more philosophical level (depth of reflection); it also shows how reflection topics can be related to the profession, the individual professional, or the wider environment (breadth of reflection). During the tutorial we first formulate questions related to the theme of communication. Then, we help students to formulate questions related to their theme of the circle reflection on a higher level.

Table 3: Breadth and with of reflection

Breadth of reflection Depth of reflection	Profession or problem	Self	Wider environment
3. epistemic/critical (*philosophical/ contemplative*)			
2. interpretative			
1 technical/pragmatic level (*problem solving*)			
0. evaluative level (*measuring effects*)			

Feedback Sessions

In the first session, related to the point reflection, a communication specialist comes in to instruct students on how to provide feedback. The other feedback sessions are used by the teachers to provide general feedback related to the individual reflection papers. Individual feedback has already been e-mailed to the students by then.

Feedback relates to readdressing the specific function and steps of the reflection mode; the role of theory, choosing the theme, the level of reflection.

Course Materials

Specifically for the course, a short syllabus has been written, that provides background information about reflection as summarized at the start of this paper, and that mainly describes and elaborates the different reflection modes, with their underlying philosophies. Also a reading guide for the book Procee (1997) is provided. As options for students to steer their reflections, some basic literature is suggested, that students could choose to use for their reflections (e.g. Curren, 2007; Procee, 1997; Schön, 1983; Simon, 1967; Wouters, 1999). But, what students ultimately choose to use, depends on their experience and chosen focus for the reflection. Therefore, in addition, students search for scientific or professional literature that connects to their reflection questions.

Teacher Roles

In the first part of the paper we have already described our teaching philosophy. In addition it could be added that throughout the years, we have developed clear and distinct roles. The role of the philosopher is to instruct the reflective theory, to provide new viewing points, to inspire students. The role of the ID teacher is to keep track of course planning and to manage the time, to provide design knowledge, and to communicate with students. Both teachers alternate the introduction, leading, and discussion of the hands-on experiences during the tutorials, and both teachers provide feedback on papers.

Assessment

In an oral meeting with each individual student, we discuss his or her work. As input for this meeting is the student's paper, consisting of four different reflection papers that has evolved through the course and has been improved based on feedback from peers and teachers. An important input for the assessment is the student's own argumentation for his grading. In the student's argumentation towards the grading we expect –again- a reflective approach. The student's subjective judgment indicating the own learning curve, is compared to the teachers' more external and comparative grading. In most of the cases, both gradings match, indicating that students are very well able to judge their own qualities as a professional. Because of that aspect we have chosen for this kind of assessment. In more formal education situations we use a different approach, according to the standards of the academic forum.

Changes In The Course Over Years

This general outline of the course has been rather stable over years, although there were some minor changes, based on experiences and student evaluations. Most changes were implemented in 2004-2005 as a reaction to two years of evaluation and experiences. Some of these changes were undone or adapted later. Major changes relate to:

- Final oral meeting: in the course 2004-2005 we decided to skip the oral final meeting, in order to save teacher time. Although the general appreciation of the course did not change and student results were not different from other years, several students indicated that they really missed this meeting, based on what they had heard of it from previous years. Therefore, we decided to bring this element back, to bring the course for each individual student to an individual end.
- Peer feedback: In 2003-2004 we were dealing with a very large group (56). Since we had experienced that providing feedback on all papers ware very intensive, we looked at possibilities to bring in peer feedback. We soon learned that this can be very motivating, and that it can have a positive effect on student attitude and achievement (Topping, 1998; see also Van den Berg, Pilot & Admiraal, 2005), although we have not deliberately measured this effect ourselves). The peer feedback has become an essential part of the course, and is included in the formulation of the course goals. Different from the first time, in the course 2006-2007, students were now explicitly instructed on providing good feedback by a communication teacher.
- The amount of teacher feedback: in 2005-2006, a year after peer feedback had been introduced, the teachers only provided general feedback in the feedback tutorial an no individual feedback. This was evaluated as a weak point during that course. Students indicated to miss this external reference, and also indicated that not every student was as good in giving feedback as others. The following year, teacher feedback was included again.

- Point reflection: the first two years, the concept of point reflection remained rather vague, as also showed in the student evaluations. Students found it difficult to step outside their own project and the teachers had no good clues of how to inspire them. We mainly used this meeting to ask students to come up with a reflection agenda. Two years ago, we experimented with the use of sayings, proverbs, sports, colors, emotions, etc. to ask students to generate inspiring and unique questions. The use of these unusual viewing points opens up students' creativity and helps them to step outside the experience.
- Order of the reflection modes: the order of line reflection and triangle reflection is rather arbitrary. Some students have a natural inclination to the first mode (especially the more evaluative types among them), others (who are inclined to discovering differences) prefer the last mode. During some years we started with line reflection, in other years we started with triangle reflection. The order made no differences in the end.
- Place of reflection in the curriculum: In their evaluations students indicated several times that they would have wanted to be familiar with the reflection techniques in order to steer their design activities. Therefore, in 2004-2005 we decided to offer the triangle reflection mode at the start of a design course, as part of stakeholder analysis. At the end of the course, it turned out that none of the design groups had made explicit use of this technique during their project. Students indicated they were not yet ready for those techniques, since the project had so many new aspects they needed every attention to control the design process (design in real context, for real client, real communication). Stepping outside the process to reflect was not yet an option for them.
- The roster: in the first two years, the tutorials and feedback sessions were planned at the same day (4 hours). Students indicated that that session was too long to stay motivated and attentive. They also indicated that the time to write a paper was very short. Therefore, in 2004-2005, we split up both sessions. Students could hand in their paper during the next tutorial. Drawback: they could already start writing before they had their general feedback.
- Step by step approaches: In the beginning years, we divided each reflection mode in three steps (preparation, reflection, and summary of learning). Students indicated to find it still difficult to reflect and that reflection remained rather vague, and that they needed more guidance and structure. Therefore, we have extended the step-by-step approaches for each of the reflection modes, by distinguishing more clearly the different steps. Although we were rather hesitating to do so, since they might see it as a simple checklist and thus might hinder them to think for themselves, students appeared to get support from this, and do not report about vagueness any more.

The Attained Curriculum

Student Perception Of The Course

Students are very positive about the course. On a scale from 0 to 10 students the mean student approval each year has been 7.9 or 8.0. No student ever gave an unsatisfactory mark (e.g. 5 or lower).

Students especially highly value the content of the course and the pedagogical approach underlying it. Students identify this course as extremely supportive for their own professional development. They like the different teaching pedagogy, although this, at the same time is difficult for several students.

Student Growth In Reflection

All students increase their reflective competence during the course, where some make impressive progress. Overall, over the years, student results have not improved, it even seems that grades are a little lower. This can be due to two causes: the changes in the courses have not resulted in improved pedagogy and thus improved results/learning; or, the teachers have become more strict in their grading.

The feedback chain is reported to provide great impulse for personal and professional growth, and it increases the quality of the reflection papers (more depth, more content).

Students usually indicate to have clear preferences for specific modes of reflection, which also always shows in the quality of their papers following that specific mode. Generally, they show least affinity with the point reflection.

Part II: Design Research Activity

This section is used to show how the systematic way of working and investigating the context has helped to shape the course, and it will provide data about the quality of the course. First, some general information is presented, regarding the number of students attending the courses over years. Next, all resources and types of data gathered are described briefly. Finally, in more length, the results of the in-depth evaluation are summarized.

General Information

Table 4 shows the number of students that enrolled class and how many of them passed or dropped out. Overall, only in a very few cases were students judged an unsatisfactory mark and obliged to attend the course next year. In each year, there was a small number of students who dropped out. They could not cope with the deadlines for the sub-papers and indicated to have too little time to do it right. They enrolled in the next year.

Table 4: # of students attending and passing the course over years (source: teacher notes)

course cycle	Cohort	# enrolled students	# of total passes	# of dropouts	# of failure	grades			
						6	7	8	9
1	2002-2003 (group 1)	10	10	0	0	2	3	3	2
2	2002-2003 (group 2)	22	20	1	0	5	9	6	1
3-4	2003-2004	56	47	9	0	5	23	16	3
5	2004-2005	26	23	3	0	4	11	8	0
6	2005-2006	22	19	2	1	4	9	6	0
7	2006-2007	22	19	3	0	4	8	6	1

Notes:

- In 2002-2003 the course was delivered twice in the same period to two different groups, because of planning problems for students. In group 1, we focused on the role of researcher, in group 2 on the role of designer. The reflection approach was the same.
- In 2003-2004 the course was delivered twice a year, due to curriculum changes. The content of both courses was the same. Therefore, in this table, the students are treated as one group;
- The evaluation results from course 2006-2007 have not been analyzed yet.

Resources

Over years, we have systematically documented and reflected upon the process and its outcomes, in order to support retrospective analysis (see table 5). As such, for each course we rely on the following documents: course syllabi, author(s)' articles, electronic learning system, teacher planning sheets and log files, e-mails between teachers and between teachers and students, course evaluations by students, student papers, written feedback on student papers by teachers and students, student grades, and external audit statements on the quality of the course. These sources reflect four aspects:

- Our theoretical assumptions about reflection
- Our theoretical assumptions about teaching reflection
- Description of the process and implementation
- Description of evaluation activities regarding the quality of the course, their outcomes and the actions taken according to them.

Course Evaluations By Students

The University makes use of an evaluation ‘smile sheet’. Usually, the response on this evaluation is low (in the range between 25-50%). Also, the questions are very general, and do not provide the information we need for this particular course. Therefore, we have formulated an extra in-depth evaluation and hand it over during the last oral session. During this meeting, the student commits himself to filling in the form in return to getting the written proof of the grading. The response rate is between 90-100%. The results to the most important questions are presented below.

Table 5: Overview of resources

	Syllabus	Articles	ELO	Planning sheet	Teach. log files	E-mails	‘smile sheets’	In-depth eval.	Student fb	Teacher fb	Student papers	Grades	External audit
Assumptions about reflection	X	X											
Assumptions about pedagogical approach		X	X	X	X	X							
Process of implementation					X	X			X	X	X		
Evaluation outcomes and actions							X	X				X	X

What reflection approach does fit you the best and what the worst?
Generally, the line and triangle reflection are valued more than the point reflection or the circle reflection. Preferences for the line reflection relate to: structured technique; discussion of ones own norms was supposed to be very useful. Preference for the triangle reflection relates to the fact that more than one frame of reference needs to be used. This enlarges ones thinking. Overall, it is remarkable that students show an inclination for those approaches that were taught in the most structured way (in their eyes). Also, a positive learning experience on an approach connects to appreciation of that approach.

Reflection needs to impact you as an Educational Designer. To what extent has this goal been reached?
Overall, almost all students (>90% each year) indicated that the course has contributed to them, for a range of reasons, such as ‘I now know how to develop myself as a designer’, ‘I realized that different points of view is not necessarily negative, but that it can also serve as an inspiration for my creativity’. ‘The course has changed my negative attitude towards reflection into a positive one’. I now know how useful it is to reflect. ‘It was useful to get to know my strengths and my frame of reference.
The few students who were indecisive indicated that they are not sure whether they will make use of such techniques often, since they found it difficult.

The pedagogical chain in the course was: introduction to reflection, practicing reflection through exercises, write a paper independently – personal and general feedback. How have you experienced this pedagogical chain?
Each year, up to 90 % of the students found the pedagogical chain effective. Most negative were the students from the 2004-2005 (25%), because of absence of teacher feedback. In previous and latter courses, the presence of teacher feedback was valued very positively. From 2005, students indicated to value the student feedback as well.
The students were very eager to indicate potential improvements/changes. These relate to assignments to be formulated more clearly, the need of better step-by-step approaches of the reflection modes, strengthening the teacher feedback, and instruction to students on providing feedback. These suggestions have actually been effectuated.

What are your experiences with working with sub-papers, building up to a final paper?
Overall, students are positive about working with sub-papers, which culminate in the final paper. As reasons, they mention that it provides structure; it involves you in a process in which you get time to adjust your views, based on feedback; it is a good way to stay involved in the content throughout the process; it reduces the pressure at the end to deliver a large final paper that should be ok in one time.

As difficult aspects, students refer to time pressure around deadlines for sub-papers. Some of them think adapting the sub-papers was not useful, producing a sub-paper was informative enough.

What are your experiences with giving and receiving feedback from peer students?
Overall, students find peer feedback very useful, also in 2004-2005 when it was introduced for the first time. As a negative aspect students indicated that not every student did well on providing feedback, so that a) it should become part of the course goals and thus rewarded or sanctioned; b) students should be instructed better on how to provide feedback. This change was implemented from 2005-2006 onwards. In 2005-2006, the evaluation showed that students liked the combination of peer feedback, individual teacher feedback and the general feedback sessions.

What is your opinion about the usefulness of the final oral meeting?
For more than 90% the final oral meeting was useful. Most reported reasons are: it provided yet another step towards my professional growth; if have again yielded new insights; it was a nice and personal way to end a course; it is a good way to be able to justify to teachers the choices you have made.

Discussion

In this paper, we have described a way to teach reflection that differs from a lot of other approaches used in education (e.g. Boud & Walker, 1998; Boud, Keogh & Walker, 1985; Korthagen & Vasalos, 2002). The design and implementation of the course was guided by the question of 'How to help students in the field of instructional design and educational technology to develop their professional expertise through systematic reflection?'

Firstly, Course evaluations of students show that they think the course is very relevant for their education and that they highly value the course. The analyses as well as our experiences provide several points for discussion that are related to the concept and process of reflection, as well as to the pedagogical approach.

First, being able to ask the right questions is a crucial condition for a good reflection. This is, however, not easy. Students can easily stay 'stuck' in their own thinking. It requires that students can be loosened from their own thinking and their own project. Asking a second –trusted- person to ask questions from a different perspective can, therefore, be fruitful. It is very helpful to realize that it is important to take a point of view outside the experience, instead of a point of view in the experience. The former yields more information and asks for a different look at your project. It is very important, therefore, to choose the 'right' person as a reflection partner. Someone who knows the project well, may be inclined to ask questions from inside the project. The same holds if you act as your own reflection partner. Reflecting with someone who does not know the ins and outs of the project may lead to more surprising discoveries. In this respect, the use of 'how' and 'what'-questions is more fruitful than 'why'-questions. The choice out of many perspectives can make students insecure. Here is also a task for the reflection partner: to make people emotionally more secure.

Secondly, reflection according to the logic of discovery is most fruitful. In this paper we described reflection approaches according to the logic of discovery rather than of improvement. Several students who had former experience with reflection approaches according to the logic of improvement started the course with a rather reluctant attitude. During the course, they changed their reluctance into an eagerness to learn more, and several of them described in their evaluation that this way of reflection was very stimulating. Such and other reactions strengthen our believe that the logic of discovery in this reflection approach is more productive than approaches according to the logic of improvement. It would be interesting to find out how teachers who are used to teach according to the logic of improvement, would value this way of reflection. Can their criteria be applied to this way of reflection, or are they two fundamentally different ways of reflecting, with own criteria and own levels of quality?

As a third point for discussion, we argue that this reflection approach can be broadened to all professions. Reflection without experience is empty, experience without reflection is blind. The approaches in this paper help students to look at their experiences in new, different ways. By looking from new perspectives, asking the right questions, students can make new discoveries with respect to their profession and their own performance. The approaches as such are heuristics for reflection, and therefore, they are not bound to educational designers. In fact, we are convinced that each professional could benefit from this approach. In the education of educational designers,

Fourthly, the depth of reflection seems to depend on the intellectuality of that person. Connecting reflection to Kant's concept of judgment, means that it is related to a (personal) power to determine which concepts and theories are and are not appropriate for 'concrete' situations. Judgment, thus, is not performing homogeneous (logical) operations but connecting heterogeneous (logical, theoretical, personal, empirical, and practical) elements (Procee, 2006a). This line of reasoning means that the depth of reflection, thus, seems to depend partly on the intellectuality of the person. Judgment, then, is a peculiar talent which can be practiced only, and cannot be taught from a zero-level. Anyway, we have experienced a major growth with some students and less growth with other students. Some remain having difficulty with the reflective approach. Although it is not more than a speculation, we got the impression that it is primarily the case with students who achieve, overall, in the whole curriculum, less than other students (e.g. they need more chances to pass exams, and/or they get lower grades). It would be interesting to see to what extent this speculation holds. First of all it needs to be determined whether those courses call upon judgment or understanding, and how the students score. Then it could be investigated whether there is a link between the results of students on those courses and on the reflection course.

As a fifth point, we argue that the pedagogical approach should be broadened to other courses in the curriculum. In line with the previous remark, we would argue that the basic pedagogical approach as we apply in our course, should be extended to other courses in the curriculum, at least to those where is called upon judgment of the students. This, because this approach motivates and supports students to develop as independent professionals, being responsible for their own development. Further elaborating on this line, we should mention that –even for us who really believed in the concept- it is really difficult to take on the role of a coach, rather than of a traditional teacher. It may not merely be expected that all teachers are ready to take on this role.

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Development of A Responsive Learning Environment Based on Handheld Devices

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Handheld devices such as cellular phones and personal digital assistants (PDA) are becoming indispensable to our daily lives for the fast technological progress. With the convenience and mobility of handheld devices, it is undoubted that they will play an important role in education and learning.

In the traditional scenario of learning, teachers usually provide learning materials and references in class for supplemental study. Evaluation is performed by writing down answers of questions listed on an examination paper. It takes time for the teacher to grade the examination papers, gather statistics of the scores and then give the scores back to students. With the assistance of computers, some of the steps in the above process are computerized and are more efficient than the traditional method. However, in most cases the evaluation and statistics can not be performed instantly in class. The teacher has to suspend the modification of learning until next class.

With the ability of computation and transmitting data remotely, portable handheld devices are suitable substitutes for desktop computers in e-learning. In our research, we propose a learning scenario supported by handheld devices that let the teach can share learning materials, giving examinations, make evaluations and statistics and giving feedback to the students. The equipment required in our prototype is a handheld device (cellular phone or PDA) with the ability of Internet connection and an embedded camera, which will be easily available and reasonable affordable in the near future. With a downloadable or built-in program, the handheld device can take a picture of a two-dimensional barcode and convert it into a sequence of characters or data.

To share digital learning references, the teacher can provide the Internet addresses of reference data to the students. The student can access the data with his/her handheld device immediately in class. The addresses of reference data can be stored in the handheld device for future study. By wireless transmission, the data can be shared with other students for cooperative learning. In practical situations, to key in the Internet addresses with numeric keys on a handheld device is a cumbersome work. We incorporate the learning scenario with a two-dimensional barcode reader program. The teacher can print the Internet address of reference data on a sheet in two-dimensional barcode format which can be shown in class. Instead on keying in the address, the students take picture of the barcode image and the barcode reader program will convert the barcode into the corresponding address automatically.

To make an examination in class, the teach creates a webpage of online examination and store it on Internet. The Internet address of the online examination is also printed out as a two-dimensional barcode. The students then access the examination webpage with handheld device and answer questions online immediately. The score is calculated automatically by the server and sent to the student. The student can understand what he/she learns in the class. The teacher then obtains the statistics of all students' scores right after the examination and makes evaluation. Due to the immediate response of the learning system, the teacher can decide to adjust the learning process dynamically. Since the examinations are tested digitally, the scores and related information such as dates, correct ratio, subjects not good at, etc. can be recorded for future estimation for both the teacher and the student.

In general, we propose a learning scenario using handheld devices as learning assistant. The scenario is designed and developed to a prototype system. Combining the functions of mobile data transmission, online webpage, mobile webpage, database server and two-dimensional barcode, the prototype system provides the teacher as well as students a convenient and personalized learning environment. The immediate feedback of the handheld-devices-based system differs from traditional desktop-computer-based and paper-based learning environment in that the teacher and students can teach and learn in a responsive and diversified way. With the advantages of learning environment based on handheld devices, we expect that the teachers are able to create more attractive activities in class and the students have stronger motivation to participate in personal and group learning.

Implications of the Flat World for Evaluation in Instructional Design and Technology

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Abstract

This article and an associated AECT presentation explore several implications of technology innovations for instructional design and technology evaluation. Questions raised about changes in society associated with technology, based on a reading of Friedman's *World is Flat,* will be discussed by participants. It is expected that they will be able to use what is discussed to build evaluation more systematically into instructional design and technology projects and processes.

Introduction

In his book, *The World Is Flat*, (Friedman, 2006) reviews several technological innovations that have impacted political, economic, social, cultural, and many other dimensions of the world we live in. He explores implications of these changes for businesses, governments, countries, disciplines such as education, and individuals on various fronts. Many of these implications raise questions about the role of technology in instructional design and associated evaluations of quality.

After identifying several potential implications from Friedman's work, this article explores three groups of questions raised and considers their value for guiding research projects and identifying alternative modes of designing and evaluating instruction. During the AECT session some of these questions will be presented to participants and they will be invited to discuss possible responses and to identify other questions they would like to answer through subsequent research and practice. Implications will be explored for building evaluation more systematically into instructional design and technology projects and processes.

This AECT session will be highly interactive and participants will be invited to think aloud with the presenter to answer the questions raised, raise other questions, and begin to articulate ways to answer these questions in terms of their own instructional design and technology projects and processes.

Implications from Friedman's Flat World

When reading through Friedman's book, I folded down scores of pages where implications for evaluation in instructional design and technology came to mind. Summaries of several of the points on those pages illustrate how thinking about a technologically flattened world raises questions worth exploring for the improvement of evaluation, which might also lead to improving instructional design and the use of technology to enhance learning. Several such summaries follow.

Open-Source Evaluation

In describing the open-source invention of the Apache Web server architecture, Friedman points out in several ways that the participants valued evaluation of their freely offered work by trusted experts provided quickly and for free. The open-source context provided this atmosphere and Apache grew so strong and so fast that IBM acknowledged the quality of their work and asked to join their community. They were allowed to do so but "the one thing the Apache demanded in return for their collaboration with IBM was that IBM assign its best engineers to join the Apache open-source group and contribute, like everyone else, for free" (p. 103). This late 1990's development points out the power of open-source collaboration which utilizes peer evaluation delivered quickly by multiple experts who value giving and receiving feedback as a way to improve common projects that have implications for proprietary projects as well.

Friedman notes (p. 112) that the principle of "tap[ping] the innovative power of the community" can be and is being applied by many others in addition to software engineers. Examples include inviting the community scientists, engineers, and geologists to help a gold mining company find ore, involving citizens in evaluating community problems and giving feedback to their political leaders, and opening the newsroom and judgment of news-worthiness of issues through blogging. Friedman summarizes the point this way, "The new model in business [as well as other areas] is that you involve your community and customers in an ongoing conversation about every aspect of your business, from the moment you conceive a product, to how you design it, to the supply chain that builds it and delivers it, to the way you collect and absorb customer feedback and respond more quickly to changing tastes" (p. 116). As with the other stories from Friedman's "Brief History of the Twenty-First Century," what are the implications for how evaluation is conceived as part of the instructional design process? What could be done to use open-source communities to provide rapid and expert feedback to teachers, learners and people trying to support them?

Technological Feedback Immediacy

Using Wal-Mart as a key example, Friedman points out several ways technology has been used to speed up feedback to employees and suppliers so they can more easily and cheaply provide their services, driving down the price of the supply chain, and ultimately the products customers want. He describes (on pages 159-162) the use of radios and satellites to guide drivers so they rarely drive an empty truck, computerized instructions and rate feedback through headphones to pallet movers, opening sales and inventory databases to suppliers to enhance a just-in-time inventory program in which suppliers are viewed as partners, and the use of radio frequency identification microchips to replace barcodes which allows "Wal-Mart to track any pallet or box at each stage in its supply chain and know exactly what product from which manufacturer is inside, with what expiration date" (p. 161). These innovations provide evaluative feedback to people who need it to produce and ship products customers want and will buy. How would instructional design be different if similar technologies were used to enhance the speed and quality of evaluative feedback from learners, teachers, and other stakeholders designers want to serve?

Insourcing Means Trusting Your Evaluator

Using the United Postal Service (UPS) as a model, Friedman notes that by building trust through basic delivery services over years, this company has been allowed "deep inside" several companies, large and small, to evaluate what is wrong with supply-chains. They then provide recommendations and services that save the companies money and even take over many of these functions so the companies they serve can focus on only a few of their original business tasks. UPS has used wireless technology to enhance accurate and efficient delivery and the Internet to encourage customers to track their own packages. They have found ways to use technology to allow them to collaborate more intimately and extensively than ever before. "In many cases today, UPS and its employees are so deep inside their clients' infrastructure that it is almost impossible to determine where one stops and the other starts. The UPS people are not just synchronizing your packages—they are synchronizing your whole company and its interaction with both customers and suppliers" (p. 175). Is that level of trust possible in instructional design? Will teachers and learners trust instructional designers "deep inside" their learning experiences and are designers prepared to evaluate the needs and experiences of learners and teachers in sensitive but accurate and rapid ways so their "customers" can see that they have provided them with information they didn't have without this help? Are there ways technology could help designers do this?

Everyone Can Be Their Own Evaluator

Using the Internet, wireless services, TiVo, Google, digitization, and other technological innovations, Friedman points out that more and more people are able to access and explore incredible amounts of information as they choose to do so and they are also able to evaluate programs, products, and people associated with that information using whatever criteria they personally want to employ. In other words, everyone is an evaluator and everyone and everything they do or produce is more easily evaluable by them and everyone else. As Friedman summarizes, "In a flat world, you can't run, you can't hide, and smaller and smaller rocks are turned over. Live your life honestly, because whatever you do, whatever mistakes you make, will be searchable one day" (p. 185). What are the implications for learners and teachers? Should instructional designers be helping learners evaluate themselves and all the potential aids to their learning more efficiently and effectively through use of these technologies? Could designers be evaluating their design efforts formatively and through the evaluative eyes of their clients better if they took advantage of these technologies? Whether they do or not, will learners, teachers, and other clients find ways to make those evaluations themselves?

These examples and several others in Friedman's book, various newsletters and technology updates remind me that evaluation is a central part of what we do as humans and technology can help us perform our decision making, information processing, moral judging better if we will allow it to. If we don't, we are likely to be judged and evaluated by others who have this same power, before we can make the adjustments we want to make.

Three Groups of Questions

Three groups of questions raised by a reading of *The World is Flat* and their potential value for guiding research and adjusting modes of instructional design and evaluation are presented below. These questions along with those raised earlier will be used to stimulate discussion during the AECT convention session. Participants will be invited to identify possible responses and additional questions they would like to address through future research and practice.

Agency

Given that technology is making the world more accessible to individuals, their evaluation skills, responsibilities, and powers are growing as well. In a business sense, technology is helping the customer, who wants to, become better informed and more discriminating or selective in what they consume. Likewise, in terms of learning, taking advantage of the privileges available through so many sources to anyone with access to the Internet and the world it opens is becoming easier for individuals everywhere. Because more people have more options or choices, they are more and more free to choose what they want to learn, how they want to learn it, and how to know if they have learned enough. In short, technology is making it possible for more of us to be full agents over our own learning.

With this power comes a huge responsibility as well. More and more, learners can be viewed as responsible for their own learning and not so dependent on teachers and others to guide them. In terms of evaluation, this means that individuals are more clearly responsible for evaluating potential information, experiences, learning opportunities, and teachers. They are also more responsible, therefore, to clarify what their own values are, what criteria they will use in judging potential learning experiences, to gather evaluative information about various resources, and to make their own evaluative judgments and decisions they will live by.

But to really have evaluation agency, individuals have to be aware that they have this responsibility. They need to develop skills of critical thinking and bias control. They need to become disciplined in their evaluation skills if they are to fully realize their evaluation powers and appropriately use their evaluation responsibilities. Simply having access to tools doesn't guarantee people can appropriately use those tools.

These realities about human agencies have huge implications for learners, teachers, and instructional designers who want to assist them. Several questions we ought to explore in understanding and dealing with these implications are listed below.

Questions Raised

Are we recognizing the role of agency and how technological innovations are impacting learners' agency? How are instructional design and evaluation theories and approaches taking this individual agency into account, if at all? Are evaluations associated with instructional design projects taking agency into account? How? How might they do this better? How are instructional technologists addressing issues of responsibility, self-interest, self-confidence, and the balance between individuals and the groups/organizations/collaboratives they are part of? What are we doing to develop theories and practices in instructional design, technology, and evaluation that respect and build upon the agency of the learners and teachers we serve?

Value for Guiding Research, Design, and Evaluation

Is it important to answer these questions about agency? Based on my reading of Freidman book and many other sources, taking human agency into account is one of the most important things we should be doing as we pursue the learning sciences, learning theories, instructional design practices, and evaluation of interventions. If we do not take into account who the people are that we want to encourage to learn better and if we do not build upon their responsibilities as well as their access and other powers that are enhanced by technological progress, we are morally responsible for violating or at least ignoring that agency. We will spend time in this session exploring that possibility and what we are doing with OUR agency to respect the agency of learners.

Sharing Values

As Friedman has documented, advances in technology have made it easier for everyone who has access to them to be exposed to a wider and wider variety of ideas and values. Living in a world flattened by technologies such as the Internet, cell phones, satellite television, etc. potentially exposes many more people than ever before to other cultures, other lifestyles, other religious views, other experiences, and other values.

This exposure makes it possible for evaluators and all the people they serve (designers, clients, learners, teachers, and so on) to better understand others' values and perhaps to reconsider their own views. However, people may still resist understanding others' values for a variety of reasons because, as mentioned earlier, they are agents and can choose to attend to whatever values they want to attend to.

A key issue in all evaluation studies is the role of stakeholder values. For many years only selected stakeholders and their values have guided many evaluations. For example, in schools, tests have traditionally been built by teachers to reflect the parts of the curriculum they valued most and felt students should also value. In businesses, the values of business owners and leaders usually take precedence over the values of the workers if they are at odds. In instructional design, the values of the people sponsoring the development of an instructional product and the values of the designer often take precedence over the values of the consumers or learners or the people they might serve with whatever they learn from the product.

However, in recent years evaluation theorists, such as Patton (1997) and Cousins & Earl (1995) have pointed out convincingly that for evaluations to be truly useful and worth the effort, all the stakeholders who are impacted by the thing being evaluated and thus, by the evaluation, should have a role to play in voicing their values and having their perspectives addressed in evaluations with which they are associated. In other words, the field of evaluation has followed the trends illustrated by Friedman and seeks to account more equitably for the multiple and often conflicting values of all the stakeholders involved.

Technology might make this process easier but it certainly makes it clear that there are many more values to be taken into account than evaluations used to attend to. Having more ready access to multiple value perspectives provides a challenge to traditions that may impact instructional designers as well. How they use evaluation to address those values with or without using technological innovations is an issue that ought to be addressed by theoreticians as well as practitioners.

Questions Raised

How does technology help reveal the perspectives of multiple stakeholders? Is it used to conceal or ignore certain values as well? How do instructional design and evaluation theories take multiple values into account? How do they ignore or inappropriately balance alternative perspectives? How are stakeholders' views and values shared and built into evaluations and associated instructional design projects? How could they be better shared? Could using technology help with this task? What should we be doing about the use of technology to understand and share values to enhance instructional design and its evaluation?

Value for Guiding Research, Design, and Evaluation

The lessons learned by evaluation experts indicate that if all the stakeholders' views are not acknowledged, the evaluation results are less important to many stakeholders. They are less likely to value evaluation conclusions and more likely to ignore them instead of using them to improve their practices. This is likely the case for instructional design as well. If the learners' values are not included in formative and summative evaluations of an instructional product, why would they value the product or conclusions about it? Thus, for practical reasons, as well as moral imperatives, the people who have an interest in or who are impacted by an instructional process or product should also have their values included in the evaluation and shaping of that instruction. Research into these issues must take the participants' views and values into account or it is not worth doing.

Trust Issues

The example cited earlier of UPS using technology to get deep inside various organizations to evaluate their financial, supply-chain, and other processes raises several trust issues. In contrast the many examples given by Friedman regarding how much information is available on the Internet regarding organizations and individuals suggest some different but related issues. In all the cases Friedman explores, it is clear that people can and will use technology to gather and interpret information that may be considered private or sensitive by others. However, often people are willing to share that information if they believe they can trust others to use that information for their mutual benefit. In contrast, many individuals may feel powerless to protect information about themselves and thus it is possible they will develop distrust of various technologies and the people using them. Implications for instructional designers who use technology and for evaluators who seek to help instructional designers improve their practices might include the following:

1. Designers cannot simply assume that the clients or consumers of their products will use technology built into the designs. Although various technologies may provide the most efficient means for sharing the products, they may not be the most effective if the users distrust and refuse to use them.
2. To get to know the clients and consumers and their needs, designers may be tempted to use technologies that these people may not trust. Sensitivity in how needs assessment information is gathered and interpreted is essential.
3. Designers and evaluators who are helping them may also want to use technologies or assume the utility of technologies in evaluating the implementation and impact of various products. Exploring how stakeholders view the technologies should be part of the evaluation process.
4. Clients and others to be served by designers and evaluators may be using technologies to gather their own evaluative information about the designers and evaluators in more sophisticated ways than expected. Trust goes both ways and all parties' trustworthiness is more easily gauged through evolving technological sources.

These trust issues highlight another growing movement in the professional evaluation field that might be important to consider by both instructional designers and evaluators. Promoted by David Fetterman (2001), empowerment evaluation has been evolving as a practiced approach for the last decade or so. This approach to evaluation involves evaluation experts serving as coaches to guide, encourage, and train various stakeholders (usually those who feel they have been in some way disenfranchised as stakeholders by an organization, group, or culture in which they function) to do their own evaluations and to use evaluation as a tool to improve their situations socio-economically, politically, and/or in other ways. Possibly, evaluation from this perspective is based on a distrust among some stakeholders that their values are going to be represented well by traditional evaluators. If instructional designers were to work with clients who wanted to use empowerment evaluation of their instructional products, they too would want to be sensitive to the trust issues involved. Finally, empowerment evaluation stakeholders may be particularly interested in using technologies that would allow them to gain the power necessary to conduct their own social agenda-oriented evaluations.

This example of empowerment evaluation and the trust issues associated with technology and other influences suggest the importance of examining the basic process that evaluations usually follow to see what other implications there may be for trust issues associated with design and evaluation practices that involve various technologies. The evaluation process is rather straightforward, though often politically charged and includes the following steps as summarized by Williams (2006):

1. Clarify who cares about the thing to be evaluated; who are the stakeholders and who's values should be included (e.g., are the consumers' and the funders' views equally important)?
2. Help the stakeholders clarify what they care about; what is the evaluand or thing to be evaluated and what aspects of it are they most interested in (e.g., an instructional product)?
3. Help the stakeholders clarify what their values are and what criteria and standards or levels of performance on the criteria those values imply for judging the quality of the evaluand (e.g., how much and what learners should learn and at what level of performance when using the instructional product).
4. Use steps 1-3 to identify the evaluation questions stakeholders want answered.
5. Develop data collection, analysis, and reporting strategies to answer the questions, focusing primarily on the main question, which is "how well does the evaluand meet the specified criteria?"

Reflection on this process reveals the point that stakeholders and their values guide the entire process. Therefore, trust levels between stakeholders and evaluators and among stakeholders can greatly impact the identification of criteria, definitions of the evaluands, questions to be asked, and methods for conducting the data gathering, interpretation, and reporting. If use of technologies by the stakeholders, by the instructional designers of the evaluands being evaluated, or by the evaluators introduce trust or reduce trust among the stakeholders at any of these stages, the entire enterprise will be affected.

Questions Raised

Is something like what UPS is doing desirable for design organizations? What would it take to do this? What could the role of technology be in doing this? Will instructional design and technology organizations allow the kind of deep involvement by evaluators that businesses have shown with UPS as their evaluator? What are the trust issues involved and how can trust be built? How do stakeholders use technology to do their own evaluations of their own operations and of potential instructional designers and/or evaluators? How does the individual empowerment of stakeholders through the use of technologies such as Internet search engines and/or the use of empowerment evaluation approaches impact their trust of professional instructional designers and evaluators and vice versa? How is the evaluation process being used in instructional design projects that use some of the new technologies? Could that process be more effective if it were refined? If so, how? What would be the interaction between a refined process, use of technologies, and trust?

Value for Guiding Research, Design, and Evaluation

Are the issues discussed earlier regarding trust, technology, and various approaches to evaluation important for guiding research on and the practice of instructional design and evaluation? The relationships among the various approaches to evaluation and how they are applied to instructional design are complex. They are further complicated when designers use technological innovations that involve the trust issues described earlier. Likewise, even if designers use more traditional tools, many of their consumers and clients may be using technologies that empower them as individuals and organizations. And these uses of technologies may complicate the trust needed between designers, clients, consumers, and evaluators in ways not well understood. Research into this phenomenon would be worth pursuing.

Conclusions and Implications

Although many other ideas will likely be stimulated by the discussion during AECT, tentative conclusions and implications of this analysis are summarized below.

First, the fields of instructional design and evaluation have always been related; but technological innovations and their influences on both fields could stimulate more thoughtful attention to how these related fields could be more integrated. We should examine more thoroughly how instructional designers can and could use formal internal and external evaluation processes to assess needs, weigh the strengths and weaknesses of alternative ways to meet identified needs, formatively evaluate emerging designs and development efforts, evaluate implementation fidelity of developed programs and products, as well as summatively judge the ultimate effectiveness of these programs and products in achieving their objectives.

Likewise, how are the various approaches to evaluation that have been developed over the last 40 years being shared with and used by instructional designers to enhance their work? Do designers know about empowerment (Fetterman, 2001), participant (Cousins & Earl, 1995), responsive (Stake, 2003), utilization-focused (Patton, 1997), fourth-generation (Guba & Lincoln, 1989), and other approaches to evaluation (see Stufflebeam, 2001 for a review of several approaches)? If they do know about them, are they using them? If so, how? If not, why? How could these approaches be modified to be more helpful to instructional designers and developers?

Second, innovative ways of using and developing technology explored by Friedman come from essentially every discipline and field of interest in the world today. Reading about them raises questions regarding how open instructional designers and evaluators are to using what others are discovering from other fields AND what we are doing to discover and innovate new uses for technology ourselves. Are we using the lessons learned by others? Are we willing to explore uncharted territory as well? What are we doing to take advantage of the new tools being shared by people throughout the world? What conversations are we having with people in various fields that would allow us to be stimulated in our creativity and to help them help us develop our own tools?

Third, agency, sharing, and trust are key issues raised by this analysis of the flat world. How are we dealing with these issues in our research and practices associated with instructional design and evaluation? Should we be addressing these issues? What difference would it make if we did? The analyses in this article conclude that these are important concepts that have powerful implications for work we are doing and could do. How can we encourage researchers and practitioners alike to take these issues seriously? How do instructional designers and evaluators think about people (one another and their clients and consumers) in terms of their agency, in terms of their trustworthiness and trustfulness, and/or in terms of their willingness and ability to understand and share their values? On the other hand, how do clients and consumers of design and evaluation projects think about each other and their project designers and evaluators in terms of agency, trust, and sharing? Does it matter how these questions are answered? If so, what can be done about obtaining answers and what can be done with results? What should we be doing as members of AECT and as an organization to address these issues?

Fourth, are the implications raised in this article from a reading of Friedman's book worth further consideration? This article claims that they should be explored further and perhaps instructional designers and evaluators should experiment with these ideas in their research and practices. In particular, lessons learned from open-source communities could be synthesized. Instructional designers and evaluators could experiment with using open-source procedures for enhancing both the design of instruction and the evaluation of those design efforts.

Similarly, could the immediacy of feedback available through new technologies that various industries have begun to use to continually inform their performance help instructional designers and evaluators in educational settings too? Although people and their learning are very different from products sold at Wal-Mart, are there practical ways to use the electronic feedback and evaluation systems Wal-Mart uses in instructional designs, schools, and other learning settings? Creatively exploring ethical and humane ways of using technology to monitor student interest, learning, performance, attention, and so on seems like a powerful way for AECT members to transfer lessons learned from others to their settings. Use of student feedback clickers (such as TurningPoint) is one example that some innovators have been exploring. What others might we consider if we took the experiences of entities such as Wal-Mart seriously in our own contexts?

Trust-building between evaluators, instructional designers, and those they serve is another issue that was addressed somewhat in this article. What else should be done to explore the role of trust in the design process? How would viewing each other as agents modify our views of and approaches to trust-building? How do stakeholders view evaluation and evaluators and how does that affect trust? What could be done using technology innovations to overcome distrust? How can instructional designers and evaluators come to see that trust-building is essential and not something that can be accomplished simply through typical evaluation methods?

Finally, are instructional designers and evaluators aware of the power individual clients and consumers are gaining through access to information newly available by use of innovative technologies? Do they see how that power can be used effectively to assess consumer needs, design solutions, deliver instructional services and products, and evaluate the entire process and outcomes? Do they see the interface of participants' agency, trust, and power with the instructional design and evaluation objectives? What differences could be achieved in learning and growth if these issues were more explicitly addressed by professionals represented by AECT?

This AECT session will provide an opportunity for participants to explore a few of these many questions. However, you are invited to join in this conversation as well by contacting me and sharing your thoughts, suggestions, and additional questions. Please contact me at david_williams@byu.edu.

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The Relationship Between Students' Interaction Styles and Learning Preferences in Online Discussions

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Abstract

Research shows that asynchronous online discussions, if appropriately implemented, can increase student knowledge and understanding of course materials (Garrison, Anderson, & Archer, 2001). However, not all students are partial to learning in an online environment. Past studies indicate that individual learning preference is one major factor that prevents some students from participating in and posting in online discussion forums. This study investigated 1) online students' learning preferences/learning styles and interaction styles in asynchronous online discussions with and without instructor's presence in the asynchronous online discussions, 2) the relationship between online students' learning styles and interaction styles; and 3) factors impacting students' interaction styles. This study has implications for the design and organization of effective asynchronous online discussions and the quality of online learning. It also contributes to effective strategies helping students adopt a more active interaction style and achieve better learning outcomes in online learning environments.

Introduction

The number of online courses and the number of students enrolled in them continues to grow; as of 2005, 3.2 million students were enrolled in online courses (Allen & Seaman, 2006). Within online courses one of the major pedagogical practices is the use of asynchronous online discussion (McLoughlin & Luca, 2000). In asynchronous online discussions, students demonstrate different interaction styles, which are the ways or habits they acquire knowledge from online discussions (Sutton, 2001). For example, some learners are constantly participating or posting more than the course requires, which allows them to be categorized by Sutton's work as having an active interaction style (Beaudion, 2002). Some are actively observing and processing both sides of the interaction from others without direct interaction, which can be categorized as a vicarious interaction style (Sutton, 2001). Moreover, some students may be neither actively involved nor an observer, which we refer to as the mixed or balanced-interaction style. For students categorized within the mixed or balanced-interaction style, their level of effort approximately equals to the minimum amount of postings of the course requirements.

According to Sutton (2000), all participants in asynchronous online discussion are involved in vicarious interaction and benefit from vicarious learning. However, the benefits of vicarious interaction "will not be as great as in the case of direct [interaction]" (Sutton, 2000, p.23). As such, designers and instructors of online learning environments should be aware of students' different interaction styles and try to promote more direct interaction in asynchronous online discussions. Correspondingly, it is important to understand what affects students' direction interaction in asynchronous online discussions.

Learning Styles

Individual learning style has been reported to be one of the main factors that prevent online students from directly participating in asynchronous online discussion (Beaudion, 2002). Individual learning style is the cognitive, affective, and psychological traits (Keefe, 1979), which students reveal when interacting with, perceiving, and responding to the online learning environment. Individual learning styles played a major role in the way students learn and process information in online environments (e.g., Assis, Danchak, & Polhemus, 2005; Ford & Chen, 2000; Riding & Cheema, 1991). This somehow leads us to believe that learning styles are static characteristics (Assis, Danchak, & Polhemus, 2005; Pena, Marzo, & Rosa; 2002). With this static characteristics assumption about learning styles, online instructors would primarily focus on how to accommodate different learning styles and preferences in order to promote more direct interaction.

However, according to Kolb (1984), individual learning styles are dynamic and change over time because of different elements, such as learning objectives and learners' role in the learning process. Butler and Pinto-Zipp

(2005) found that there was no single dominant learning style of students in online courses and most online students displayed a dual learning style. Similarly, Fahy and Ally (2005) found that students' cognitive styles were not significantly correlated with their preference for instructional delivery modes. Therefore, it is viable we can treat individual learning styles as dynamic characteristics and focus on how to direct students to adapt to and change their roles in online learning environments.

The purpose of this study was to investigate online students' learning styles and online interaction styles in asynchronous online discussion with and without instructor's presence in the discussion. It also looked at the relationship between online students' learning styles and their online interaction styles. Specifically the research questions were:

- What kinds of interaction styles (active, vicarious, or mixed style) did the students display in the asynchronous online discussion with and without instructor's presence?
- What kind of learning styles did students display in the asynchronous online discussion?
- What factors impacted students' interaction styles in the asynchronous online discussion?

Method

The context of the study was two graduate Educational Technology courses offered at a large Midwestern university; twenty-one students voluntarily responded to the surveys. The first course was an introduction to instructional design and the second one was a foundations of distance education. Asynchronous online discussion was a mandatory course component without instructor's presence in the first class, which had weekly face-to-face meetings. Asynchronous online discussion was the main instructional method with instructor's participation and facilitation in the second class, which was delivered via WebCT with a few face-to-face meetings.

The participants were the students who enrolled in both classes. The student's body had a wide variety. There were graduate students, school administrators, and other working professionals. The participants were from a variety of different fields too, such as education, technology, computer graphics, and engineering. Both courses had students with different ethnicities, such as white (n=14), Africa American (n=3), Hispanic (n=2), and Asian (n=2). Students' ages ranged from 21 to more than 40 years old. Students had different levels of experiences with online discussions and online courses. Thus, participants had a wide variety in terms of student characteristics in online courses.

A student online interaction style survey was administered to all students enrolled in two classes at the end of the courses. Survey included Likert-scale items focused on students' online interaction styles, online learning styles, factors impacting online interaction styles, and online learning activities. It also included some open-ended questions that were intended to solicit other factors impacting student interaction styles and students experiences with and without the instructor's presences in online discussions. The Likert-scale items were created based on definitions of vicarious learning, i.e., learning through observing (Banduara, 1986) and vicarious interaction, i.e., observing and processing both sides of the interaction/discussions (Sutton, 2000). Some of the questionnaires that are tracking "lurking" students in online discussion created by Michael Beaudoin (2002) were also included. Sample items are: 1) I often processed ideas from reading others' postings even when I was not visibly participating in the online discussion; 2) I was more of an autonomous learner and seldom got too engaged in group online discussion; 3) I preferred interacting and discussing the course content materials with others in order to learn more effectively; 4) I would not have participated in the online discussions/postings if it was not graded; 5) I preferred reading others' postings and comments to writing my own discussion postings.

For the confirmation purpose, we triangulated the data from students' responses of their interaction styles and learning styles with their learning activities and participation activities (such as number of postings and logins) in WebCT to classify them into different interaction and learning style categories. The survey was also pilot-tested and modified.

Results

Survey results indicated that students (N=21) employed the various interaction styles defined by Sutton's work in asynchronous online discussions (see Table 1). With instructor's presence in terms of facilitating and monitoring the online discussion, more students (n=7) displayed active interaction style in the asynchronous online discussion. Without instructor's presence in the asynchronous online discussion, more students (n=5) displayed mixed or balanced-interaction styles in the asynchronous online discussion. With instructor's presence in the discussion, only one student (n=1) identified his or her participation as vicarious interaction.

Table 1: Students' interaction styles in asynchronous online discussion

Interaction Style	Without instructor's presence		With instructor's presence		Total Responses	
	# of responses	Percent	# of responses	Percent	# of responses	Percent
Active Interaction	3	30	7	64	10	48
Vicarious Interaction	2	20	1	10	3	14
Mixed Interaction	5	50	3	26	8	38

In addition, students displayed different learning styles in the asynchronous online discussion (see Table 2). It was interesting that without instructor's presence, 90% of the students would prefer to discuss content materials with others; while with instructor's presence, 91% of the students reported that they processed ideas from reading others' postings without visible participation. Most students seemed to have dual learning styles either with or without instructor's presence. But with instructor's presence in the online discussion, only 27% of the students indicated that they were autonomous learners and seldom got too engaged in group online discussion.

Table 2: Students' online learning styles in asynchronous online discussion

Learning Style	Without instructor's presence		With instructor's presence	
	# of responses	% of Total responses to the item	# of responses	% of Total responses to the item
Preferred to discuss content materials with others	9	90	6	55
Preferred to read others' postings	6	60	6	55
Was an autonomous learner and seldom got too engaged in group online discussion	6	60	3	27
Processed ideas from reading others' postings without visible participation	7	70	10	91

The main factors impacting students' interaction styles were individual learning styles, such as preference for discussing content materials with others (N=16) and preference for reading others' postings (N=12), instructors' involvement in asynchronous online discussion, and course requirements (e.g., requiring peer feedback). Other factors such as time, class size, and content difficulty also impacted students' interaction. However, there was no strong indication of a specific learning style for a particular online interaction style. For example, although students may have indicated particular learning styles, they could have also indicated the same interaction style.

Discussion

There were more active interaction style learners in the asynchronous online discussion where the instructor was directly involved in the discussion and students were required to respond to others' postings. Without online instructor's presence in the asynchronous online discussion, more students easily "melted" into the mixed-interaction styles, the "didn't do a lot and … didn't do a little" and "did just enough" to meet the minimum requirement(s). Consequently, the chances of in-depth discussions are greatly reduced. Thus, instructors' facilitation and monitoring in asynchronous online discussion are critical for effective learning and positive learning experiences in asynchronous online discussion.

This study also demonstrated that students displayed dual learning styles in asynchronous online discussion, which confirmed that learning styles are dynamic (Kolb, 1984). The result was also consistent with previous research findings on students' dual learning styles in online learning environments (Fahy & Ally, 2005; Pinto-Zipp, 2005). However, it failed to find any direct association between learning styles and interaction styles. For example, although most students (at least 60%) in the online discussion without instructor's presence indicated preference for active discussion, only 30% of the students were actively participated in the online discussion. On the other hand, only 55% of the students in the online discussion with instructor's presence indicated preference for active discussion with others, 64% of the students were of active interaction style. This finding tells us that even students are of "passive" learning styles, with effective guidance and feedback, they can become active learners and active participants in online learning environments and vice versa.

Although learning styles or preferences were the strongest factors impacting students' interaction styles in asynchronous online discussions, online instructors could influence or change students' predominant interaction styles. Online instructors can help online students become more actively interact with others through effective facilitating and commenting on different perspectives. In addition, some students responded that effective course design, such as providing interesting discussion topics and sharing participants' background information, can also help students' adapt to a more active interaction style

Although the researchers made very effort to correctly identify students' interaction styles and learning styles, there was no guarantee that every student was correctly classified into the right category because several students reported that they have changed interaction styles/learning styles as the course preceded. Thus, future studies should explore why and how students change their interaction styles and learning styles in online learning environments. In addition, the participants were graduate students and most of them had previous asynchronous online discussion experience(s), which may affect their interaction styles or learning styles in the online discussion. Finally, the sample size is quite small. Therefore, more data from a wide variety of student body in terms of online learning experiences are needed.

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Designing An Online Course: What Does It Take?

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Abstract

What does it take to design an online course? This paper discusses the question and highlights online course design challenges which can't be easily resolved according to technology-mediated or online course design literature. Initiated from the first-hand knowledge of a case study, the discussion is centered on the review of online course design literature, online course designers' challenges and solutions, and online students' feedback on designers' solutions for design challenges. Implications help overcome real-world design obstacles.

Introduction

Designing an online course is a complex and challenging task. First, online course designers can not simply transfer traditional instructional methods online without adaptations (Moore & Kearsley, 1996). Second, with the prevalence of online courses in both higher and K-12 education, more online course designers without extensive educational background are facing challenges in online courses development (Shrivastava, 1999). Now, we ask: what does it take to design an effective online course? In order to answer the above question, we'll have to look at the literature and find out what the literature offers for online course designers first.

Literature Review

A wealthy amount of literature related to technology-mediated, especially online course design, can be roughly classified into three categories: 1) critical factors impacting students' online learning; 2) models and frameworks for online course design; and 3) practical guidelines for online course development.

The first *critical factors* category provides an overview of major factors impacting students' learning and learning experiences in online environments. These factors are online interaction (e.g., Moallem, 2003; Moore, 1989), a sense of presence (e.g., Shin, 2002; Tu, 2000), online community (e.g., Mayer, 2005; Stepich & Ertmer, 2003), and the role of online instructors (Berge, 1995), to name a few. Such literature resources define and explain online interaction, presence, online community, the role of online instructors and the importance of such factors of effective online learning. In summary, the first category provides a knowledge base, which tells what online course designers should focus on and why they should focus on those factors during the design process. However, online course designers still have to make their own decisions regarding critical factors in their contexts.

The second *models and frameworks* category provides procedures and steps in the process of online course design and strategies for integrating instructional principles and learning theories into the design. These models and frameworks usually contain a combination of a set of instructional design principles for analyzing the content and learners (e.g., Johnson & Arogan, 2003; Shearer, 2003) and promoting social interaction and a sense of presence (e.g., Moallem, 2003; Northrup, 2001). However, most models and frameworks require instructional design background to comprehend and implement them effectively.

The third *practical guidelines* category provides general guidelines for online course development. For example, with the prevalence of online courses, some organizations and universities have created/adapted their own guidelines for online course development. In reviewing these guidelines, we found that most guidelines are too general to provide solutions for real design challenges. In addition, most guidelines are for the purpose of evaluating online courses rather than directing the online course design process.

A Case Study

A graduate online course was designed by an advanced doctoral student and a faculty member at a large Midwestern university. The course was on online education and targeted for graduate students, faculty members, and administrators. It was co-taught by the same two designers. At the close of the course in Fall 2006, students' feedback and reflections on their learning experiences, especially on specific course design features, were solicited through an online survey.

Challenges Encountered

During the design process, we encountered several major challenges which were unique in online course development and were not readily to be resolved according to the literature. The major challenges encountered were: 1) how to select the course content to meet the most varied students in terms of entry level knowledge, given the potential that an online course provides opportunities for more knowledge seekers; 2) how to introduce the content to students effectively and efficiently rather than telling students to read everything or posting "a real long lecture" (e.g., PowerPoint slides or video clips); 3) how to help students process the large amount of information generated from weekly online discussion.

Knowing the characteristics (e.g., information overload) of technology-mediated instruction and our unique context, we came up with our own design solutions, such as preparing two (introductory and advanced) levels of reading materials and the "something to think about," which were one-page summaries of weekly readings that highlighted important ideas for weekly online discussions. Our students responded positively to these solutions, which saved students' time, avoided information overload, and most importantly, directed students' learning. Students' positive feedback confirmed our design solutions and provided insights into the online course design.

Conclusion

According to our knowledge and findings gained from the case study, we concluded that it takes content (subject) knowledge, the knowledge of online education, and the knowledge of different models and frameworks for online course development to design an effective online course. It also takes an open and detail-oriented mindset. Last but not the least, online course designers should be prepared to collect and solicit online students' feedback on different aspects of an online course during the design process.

We hope that our study and the solutions we presented can help more online course designers overcome their challenges. We also hope there will be more such discussions that can be added to the literature to guide online course designers.

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