DOCUMENT RESUME

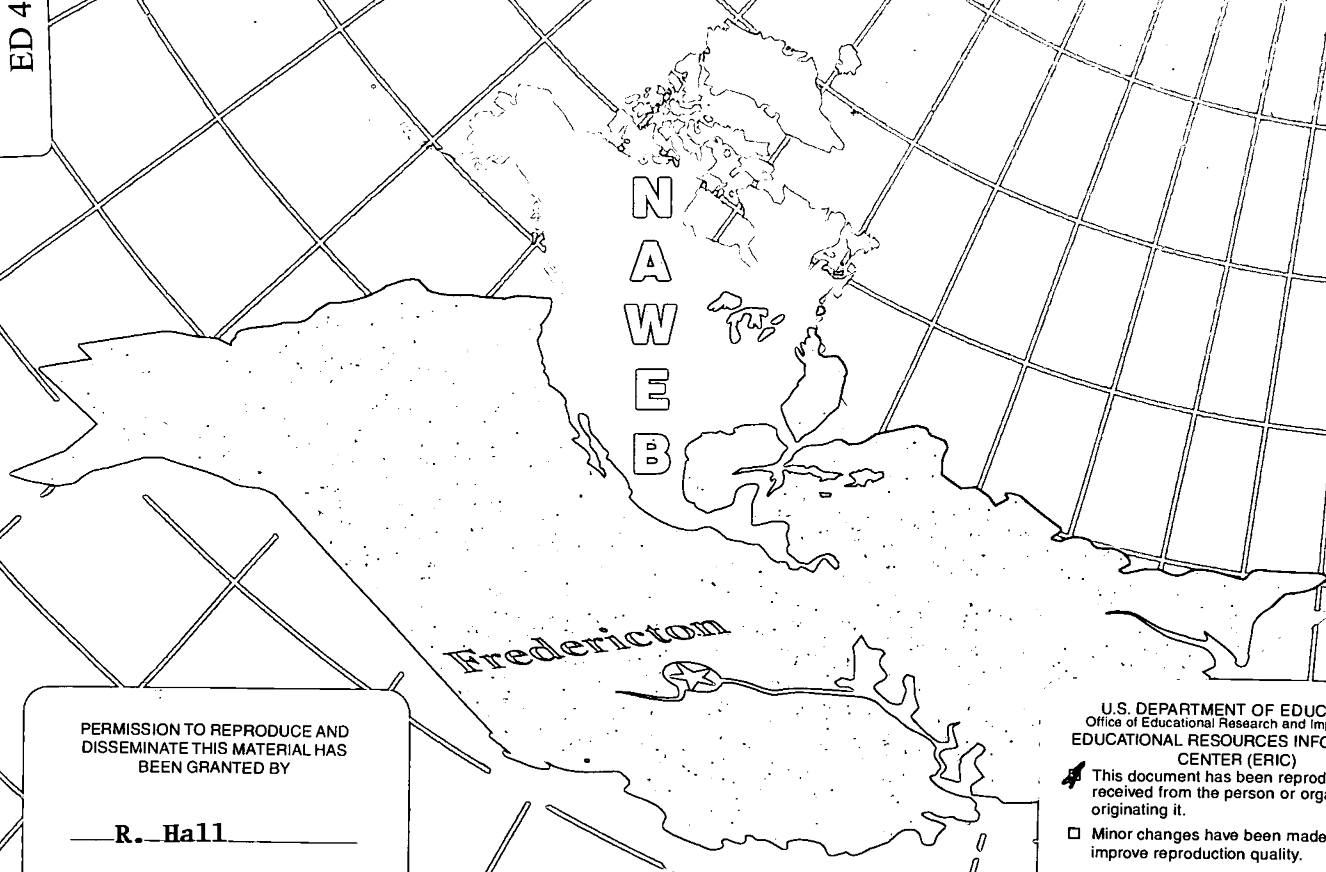
ED 475 527	IR 021 854
AUTHOR	Ellis, Allan, Ed.; Hall, Rik, Ed.; Li, Jeni, Ed.
TITLE	Proceedings of N.A.Web 2001: The International North America Web-Based Learning Conference (7th, Fredericton, New Brunswick, Canada, October 13-16, 2001).
INSTITUTION	New Brunswick Univ., Fredericton.
ISBN	ISBN-1-55131-025-2
PUB DATE	2001-10-00
NOTE	126p.; Published by Integrated Technology Services. Cover title varies. For the 6th (2000) International Conference, see ED 454 847.
AVAILABLE FROM	NAWeb, Computing Services Department, Room D11, Head Hall, P.O. Box 4400, Fredericton, New Brunswick E3b 5A3, Canada ($30). Tel: 506-447-3018; Fax: 506-453-3590; e-mail: hall@unb.ca; Web site: http://naweb.unb.ca/proceedings/index.html. For full text: http://naweb.unb.ca/ proceedings/2001/index.htm.
PUB TYPE	Collected Works - Proceedings (021)
EDRS PRICE	EDRS Price MF01/PC06 Plus Postage.
DESCRIPTORS	Distance Education; Foreign Countries; Higher Education; Instructional Design; *Instructional Development; Metadata; Open Education; Problem Based Learning; *Technology Integration; *Technology Uses in Education; *Web Based Instruction; World Wide Web
IDENTIFIERS	North America; United States

ABSTRACT

NAWeb 2001, the International North America Web-Based Learning Conference, focused on innovative and practical uses of the World Wide Web in teaching and learning. This proceedings contains the following papers: (1) "Roles of Parties Involved in Distance Learning" (Ahlam Al-Bassam, Peter Neubert, Ali Al-Shammari); (2) "The World Wide Web, Problem-Based Learning and Post-Graduate Students: The Perfect Match" (Allan Ellis); (3) "CanCore: Metadata for Learning Object Repositories" (Norm Friesen); (4) "Java Applets and Mathematics" (Garrett D. Heath); (5) "The Use of Open and Distance Education in Facilitating Changes in Managerial Development: The Mexico Experience" (Jose Gpe. Vargas Hernandez); (6) "Web Based Instruction: A Paradox and an Enigma of Instructional Paradigms, Pedagogy and Design Principles" (Michael G. Kadlubowski); (7) "Integration of WebCT into the Distance Education Administrative Model at the University of Manitoba (One Year Later)" (Janice Miller, Peter Tittenberger); (8) "Integrating Web-Based Curriculum as an On-Line Resource for an Undergraduate Introductory Statistics Course--TAKE 2!" (William J. Montelpare, Moira N. McPherson); (9) "The Way of Significant Innovation: When Gutenberg Became Nonlinear" (Jose Jesus Garcia Rueda, Fernando Saez Vacas); and (10) "From One to Many: Cultural Change in an Adult Learning Institution" (Deborah J. Smith, Emilie W. Gould). The following poster sessions are also included: "Web Portals at Southern Cross University: Supporting Staff and Students" (Allan Ellis, Sue Sawkins); "Development of an On-Line Resource for Undergraduate Biomechanics" (Moira N. McPherson, William J. Montelpare); and "Recognition of Conative and Affective Behavior in Web Learning Using Digital Gestures" (Abhijit Rao). (MES)

N.A.WEB 2001

The Web-based Learning Conference



The 7th International NAWEB Conference

Integrated Technology Services
University of New Brunswick

N.A. Web 2001
The Web-based Learning Conference

October 13-16, 2001
Fredericton, NB, Canada

edited by
Allan Ellis
Rik Hall
Jeni Li

Proceedings of N.A.Web 2001
Seventh International North America Web-based Learning Conference
Fredericton, New Brunswick, 13-16 October, 2001
an IW3C2 Endorsed Regional Conference

University of New Brunswick

Published by:

Integrated Technology Services
University of New Brunswick
PO Box 4400
Fredericton, New Brunswick Canada E3B 5A3

Email: hall@unb.ca
World Wide Web: naweb.unb.ca

Cover Design: Angel Gomez

Purchase Inquiries:

Price per copy: $30.00
Rik Hall
University of New Brunswick
D11 Head Hall
PO Box 4400
Fredericton, NB
E3B 5A3

ISBN 1-55131-025-2

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Preface

NAWeb 2001 - The Web-Based Learning Conference

an IW3C2 Endorsed Regional Conference

First — I am pleased that you have chosen to maintain normality and have joined us at NAWeb 2001 — The Web-Based Learning Conference. The horrendous events of September eleventh leave us saddened and numbed. My prayers and thoughts are with our good friends to the south — with those who have been touched first hand by the tragedies as well as the countless others whose lives have been changed. We have had cancellations because of the disruptions and I certainly understand.

Seven years is a long time to have been running this conference. There have been lots of times I have said "This will be the last" and then good friends and colleagues come along and say, "We'll help, let's do another one" and so we continue. And with the fantastic people who come to each conference I get to learn from the best.

NAWeb 2001 <http://naweb.unb.ca>, is the seventh annual international conference specifically dedicated to exploring educational opportunities on the Web. This annual get-together remains the same in focus: a forum for those people who are designing, developing, and delivering Web-based teaching and learning. The attraction of the marriage of the educational arena and the World Wide Web is our common bond. One we can talk about, share ideas, successes and frustrations.

NAWeb 2001 - The Web-Based Learning Conference is only possible because of the support of the Integrated Technology Services at the University of New Brunswick and is assisted by a collaborative relationship with Southern Cross University.

As chair of the conference I am pleased to present to you this print copy of the Proceedings of this year's conference. This paper product is only possible because of the presenters, the Program Chair, Allan Ellis, the many reviewers that Allan talked into helping with the process, and my good friend Jeni Li for her tireless formatting skills!

I also must give thanks to Clint Isbell for his leadership with the NAWeb Posters and Ron Smith and his NAWeb Awards 2001 Committee.

Jobs well done!

I truly feel that these papers and the posters represent an excellent cross-section of Web issues from both a national and international perspective.

I am glad you are here. I trust you will get as much out of this conference and these proceedings as I will.

Rik Hall

Paper Review Process

Full papers submitted to this year's International North American World Wide Web Conference, NAWeb01, were subject to a double-blind review process and were reviewed by at least 2 members of the International Review Panel. Authors were required to address the reviewers comments and submit final copies of their paper. The Conference Organising Committee would like to thank these reviewers (listed below) who accepted the invitation to review of this year's conference.

Poster presentations have been published as short edited papers (posters are not reviewed). Clint Isbell acted as Poster Chair.

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MESSAGE FROM THE MAYOR

Greetings and welcome to Fredericton!

On behalf of my City Council colleagues and the citizens of Fredericton, I am delighted to welcome delegates attending **NAWeb 2001 – The Web-Based Teaching and Learning Conference**. My congratulations go out to the University of New Brunswick's Computing Services Department on the successful organization of this event, now in its seventh year.

Fredericton is very pleased to host this annual international conference, and I am confident that our friendly maritime hospitality, combined with our modern facilities and accommodations, will ensure a pleasant and memorable stay in our provincial capital.

Best wishes for an enjoyable and informative **NAWeb 2001**!

Les Hull
Mayor

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OFFICE OF THE PRESIDENT AND VICE-CHANCELLOR

UNB
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September 18, 2001

Dear NAWeb 2001 Participants,

The University of New Brunswick is honored to host NAWeb 2001 – the Seventh Annual International Conference on Web-based Teaching and Learning. We are delighted to have you here with us at the most beautiful university campus in the country – and at one of the most beautiful times of the year in Atlantic Canada.

This year's conference will focus on innovative and practical uses of the World Wide Web in teaching and learning. You will also hear about extending the reach of existing campuses and creating virtual campuses of a new and unique nature. I urge you to take full advantage of being at an institution on the leading-edge of this innovative field.

And please take a few moments to have a look at Fredericton and the University of New Brunswick. You will find beautiful scenery, friendly people and warmth and hospitality found only in Atlantic Canada.

Welcome to UNB!

Yours sincerely,

Elizabeth Parr-Johnston

Elizabeth Parr-Johnston, PhD
President and Vice-Chancellor

New Nouveau
Brunswick

As Premier, it is my pleasure to welcome you to the City of Fredericton and the Province of New Brunswick for the seventh Annual International Conference on Web-based Teaching and Learning. Throughout this conference you will have the opportunity to discuss the latest developments in web-based learning and share knowledge with your colleges from around the world.

In recent years, the web has proven to be an increasingly important educational tool, and as such, it is constantly necessary to revisit the issue of on-line technology-assisted learning. The new ideas and solutions developed at this conference will help the web to grow as never before, and will change the way we as a society teach and learn.

Congratulations and best wishes for a successful and enlightening conference.

En tant que premier ministre, je suis heureux de vous accueillir dans la ville de Fredericton et la province du Nouveau-Brunswick à l'occasion du septième congrès international annuel de l'enseignement et de l'apprentissage par Internet. Ce congrès vous donnera la chance de discuter des derniers développements en la matière et d'échanger des connaissances avec vos collègues du monde entier.

Au cours des dernières années, le Web est devenu un outil éducatif de plus en plus important et, pour cette raison, il nous faut revoir constamment la question de la technologie au service de la formation. Les nouvelles idées et solutions qui jailliront de ce congrès favoriseront plus que jamais la croissance du Web et changeront les modes d'enseignement et d'apprentissage de la société.

Je vous félicite et je vous souhaite un congrès des plus réussis et instructifs.

Bernard Lord
Premier / Premier ministre

Roles of Parties Involved in Distance Learning

Ahlam Al-Bassam, Kuwait University (Kuwait)
Peter Neubert, Kuwait University (Kuwait)
Ali Al-Shammari, Kuwait University (Kuwait)

Abstract

Distance learning has been gaining high interests recently, especially in regions where students are geographically scattered and/or affected by different factors that could influence their learning capabilities. Human beings and technological parties are playing important roles within the new trend of learning Distance Learning . A focused attention should be paid to investigate the roles of human as well as technical parties within distance learning environment. In this paper, we will present a summary for all important parties within distance learning environment. Also, we will illustrate the roles of the important parties and explore how these roles may affect on distance learning styles. In section 1, an introduction will be presented about the distance learning styles. In section 2, we will focus on presenting the major components of any computer-based learning systems within distance learning trend. In section 3, we will explain the relationship as well as interaction between the main components. In section 4, we will discuss the roles of human being and technical resources. Finally, we will draw our summary and conclusion.

Roles of Parties Involved in Distance Learning

Introduction

The advancement of new technologies within various disciplines, such as Internet, Communication, Multimedia and Database, have enriched the learning activities and spawn new learning styles in an era called Distance Learning or Distance Education . This topic has been the subject of extensive research activities during the last ten years. The combination of learning, computing and technology is of great interest for many countries. Therefore, politicians, technological people, educators and others encouraged researchers to investigate and explore new learning styles that would go beyond the classical barriers and facilitate the learning process as well as satisfy students learning needs.

Most of learning activities in the 18^{th} and 19^{th} centuries were covered by the classical model, which depends on the idea of instructor-and-notes . This model became widely spread since the 1900 s [1]. It was powerful in supporting the learning process and capable in satisfying most of the centralized students learning needs.

The classical learning model aimed to meet the most important objectives of the learning discipline. For instance, the delivery of information to learners, the existence of concurrent interaction between instructor as well as students, the increase of knowledge accumulated ratio and the growth of student s experience. Based on the classical learning model, students are grouped according to their ages and/or experience, and are gathered together in a classroom in order to learn a specific topic from the instructor s presentation at a specific time [2]. Also, it has been efficient for along period of time. In this model, knowledge is transferred to learners linearly in the form of textbooks, speech or report [3]. However, it is associated with several constraints as follows:

- Classical learning model suffers from Time and Space constraints, where the lecture has to be presented in a specific time, as well as location, which is usually be in the same institute or university. These scheduling constraints may cause a lack in attendance, which may have a negative impact on the learner s educational level [2].
- Because of the limited size of a classroom, a large number of students could not register or join the required lecture. Thus, the classical learning model is not highly scalable.
- It suffers from the rapid cost for offering advanced courses to hundreds of students.
- Another constraint would be the high ratio of students to teachers, which has limited the learning efficiency for each individual student [1].
- Schools are not available all the time, because it might be affected by weather conditions, summer holiday, and so on.

Therefore, these constraints lead researchers to investigate for new learning styles, which aim to relax the constraints impacts on the learning process, provide new learning services to a huge number of distributed students, and eliminate the drawbacks of the classical learning style. As a result, distance learning styles became the solver for such constraints. Meanwhile, before we step a head, it is necessary to define the term distance learning .

The term distance education puts emphasis on the separation of the learner and the educator in space and/or time [2]. From other researchers point of view, it would be possible to use different expressions indicating for distance education like distance learning, resource-based learning, distance teaching, distributed learning, flexible learning, remote classroom teaching, and many more [4]. Each one of these expressions has its own characteristics and properties [2], but all of them aim to include most of the possible contexts of education and training, taking into consideration their initial and continuing features for degree and non-degree programs, and embrace all level of formal education, from school to advanced higher education [4]. There are several circumstances formed motivations such as the necessity of handicaps students, the existence of dropped and/or adult students, and the requirements of rural districts to explore new learning styles that would be beneficial for those dispersed learners. Distance learning styles have been evolved from premature ones Radio classes during 1950 s to more advanced TV classes, which had been transmitted to audiences in Europe [2]. However, these transmitted classes suffered from time scheduling constraint, and did not provide any sort of bi-directional interaction between learners and instructor. This has reduced the importance of radio and TV as new resources for learning activities. In 1980 s, technology growth has offered some sort of interaction techniques between learners and their teacher, such as telephone services, fax machines, and TV closed circuits. During 1990 s and because of the emergence within communication, networking and multimedia technologies, students have been provided with several techniques of interaction with their instructors such as electronic mail, voice chatting, telephone and video conferencing services.

CD-ROM and video tape courses were spreaded as another distance learning style in the early years of 1990 s. It has offered students with multimedia presentation capabilities, and allows them to review course material according to their own learning methods, learning speeds, and cognitive capabilities. Courses can be stored and delivered by CDs and/or tapes in order to be presented on computers or VCRs [1][4]. However, this style is associated with several constraints such as limited storage capacity of the CDs, difficult to update or replace a part of its out-to-date material, and did not support any sort of communication with instructors [1].

Because of the achievement within Multimedia computing and networking infrastructure, computer-based learning has been considered as the dominant distance learning style. It become more advanced and powerful, especially by integrating multiple media of information within an individual courseware and providing more effective and expressive ways to present the learning materials. In addition, Internet opens a wide door for facilitating the learning process by enabling researchers and developers to design and develop sophisticated Web-based applications. The Web-based educational media are being developed rapidly and emphasize to generate scalable, durable, fully accessible, highly available, and interactive distance learning systems.

In this paper, we will focus on the roles of parties who are involved in distance learning environment.

Major Components of Distance Learning Systems

Recently, several researchers have expressed their views about the specifications of computer-based learning systems [1][2][4], but there is no standard framework for developing Web-based learning applications. On the other hand, few researchers have proposed guidelines about the characteristics and properties of such systems [2][4], one of these research bodies is the multimedia research group at MIRL Lab-University of Ottawa [1], which has proposed a generic architecture for Multimedia Interactive Telelearning System over broadband networks [1].

We have adopted this architecture and enhanced it to suit all computer-based learning systems over the Internet or Intranet.

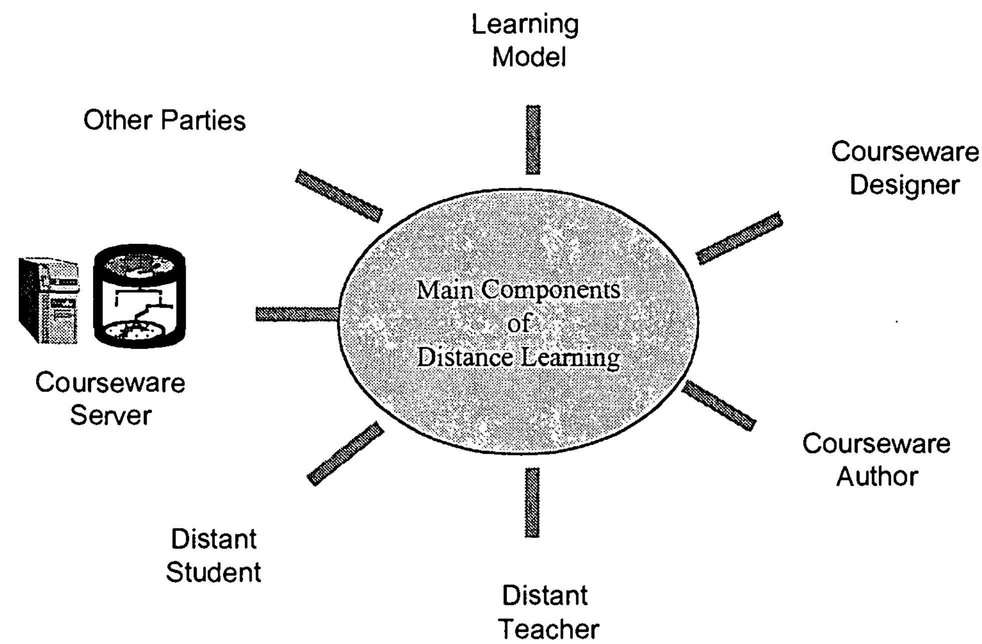

Figure1. Enhanced Generic Architecture for Computer-based Learning Systems

Our proposed computer-based learning system for distance education environment consists of seven main components: Learning Model, Courseware Designer site, Courseware Author site, Distant Teacher site, Distant Student site, Courseware server, as shown in Figure 1.

Beside these main components, there are other players or parties who offer and/or introduce some expertise to enrich the provided learning services. These parties include multimedia experts, database specialists, systems administrator, on-line facilitator, teacher assistants, etc. The roles of these parties are essential for the distance-learning environment in order to accomplish the learning process goals. They are distributed through the system's phases, starting from the problem specifications to analysis, design, implementation, testing, and finally the system utilization. These parties are playing a tremendous role to design, implement and test a successful computer-based learning system within distance education environment.

The Interaction between the Major Components

In order to illustrate the roles of parties that are involved in distance learning environment, we have to reveal the relationship between these parties and explain how they interact with each other.

Some researchers have focused only on the relationship between teachers-students [5], teachers-courses [6], and students-courses [7]. But, No body has examined clearly the complete relationships between the major educational participants. Also, no body has studied the roles of all parties within distance learning environment. Most of researchers have focused only on the 3 sides of the triangle student-teacher-courseware . While in our model, we will focus on the five most important components of the computer-based learning system. This will lead us to explain and illustrate the roles and responsibilities of all parties in the next section.

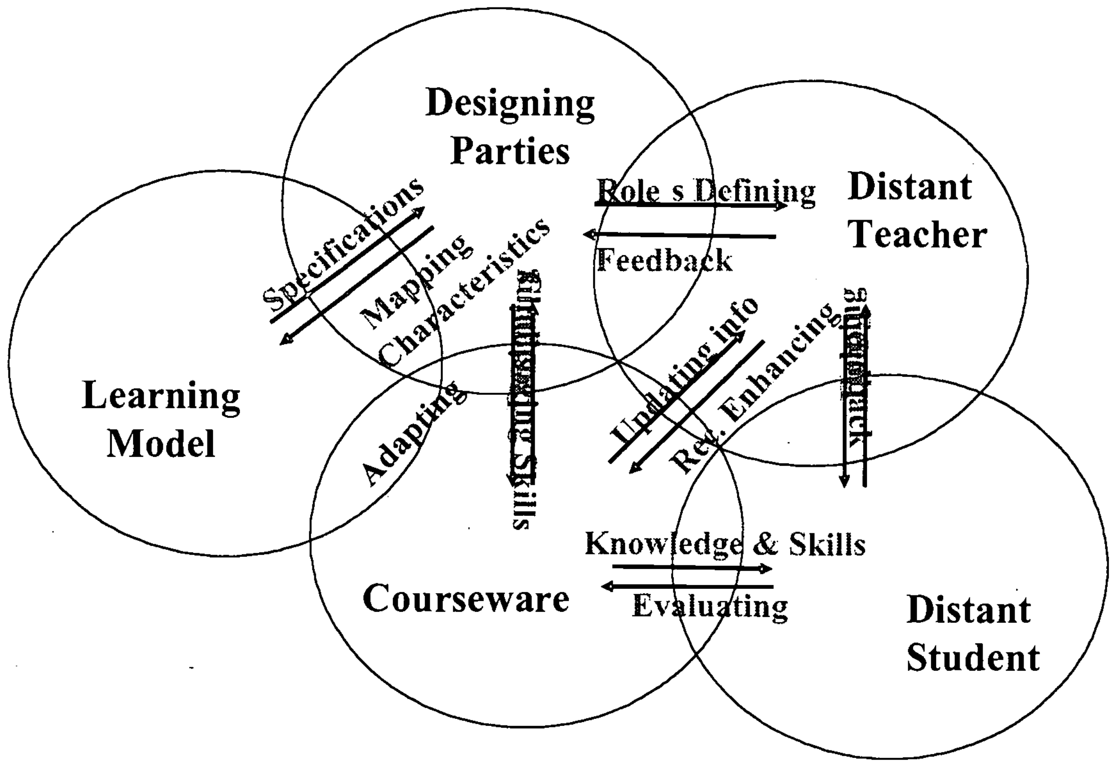

Figure 2. Main Components Interaction

The main components of the distance learning system must interact with each other in a harmonic manner in order to achieve the learning goals and accomplish the required tasks. These five components are shown in Figure 2, and their interaction can be described as follows:

The learning model and the designing-parties

Basically, the learning model contains all characteristics, specifications and features that are offered by the system, also it describes the logical as well as presentation structures. So, the courseware designer and courseware author have to work together and cooperate in order to construct the courseware based on the specified learning model.

Thus, designing parties are mapping the learning characteristics at the constructed courseware.

The designing-parties and the courseware

Obviously, the courseware designing parties would design and construct the courseware by following specific rules and policies. In addition, the courseware designing parties may gain challenging skills in order to construct an efficient, flexible, and dynamic courseware.

The learning model and courseware

The courseware has to adapt the functions and features of the learning model in order to be constructed and being available for the distant students.

The designing-parties and distant-teachers

The designing parties and distant teachers are affecting each other. The designing parties analyze teacher roles and translate their theoretical tasks into practical issues. On the other hand, the distant teachers feedback the designing parties with the student s recommendations and evaluations of the courseware. In addition, distant-teachers have the authority to propose enhancements for the courseware, and grade the courseware based on student s performance and their capabilities in solving the difficulties that they might encounter during their learning process.

The distant-teachers and the courseware

Since distant-teachers are having a great impact on the learning process, so they are influenced by the courseware construction and they are required to keep updating their information with the latest knowledge. This will ease the knowledge transfer to the scattered students. Beside that, distant-teachers may have the authorization to enhance the constructed courseware.

The courseware and the distant-students

Once a distant student is registered to study a courseware, a student profile will be created to keep track of all necessary information, such as personal information, tests results and distant-teacher's comments. Distant-student starts the learning process to gain knowledge and skills. Distant learners exploit the system's features and/or functions for more benefits. In addition, distant-student may evaluate the courseware as well as express their impressions, and might give remarks.

The distant-teachers and the distant-students

The interaction between the distant-teachers and distant-students is very strong. Since, distant-teacher guides the distant-students and provides them with advises that would help their learning actions. Also distant students can ask for assistance through media technologies, email, chatting and phone at any time. The distant-teacher has the freedom to offer the distant-students a bi-directional communication session through multimedia technologies, to discuss various learning issues. Moreover, distant-teacher can view the distant-student's profile in order to check the student's progress and give proper advises and guidance. In addition, distant student can be authorized to join another courseware in order to improve his/her knowledge and/or skills.

The Roles of Human Being and Technical Resources

Distance learning environment has evolved with different types of participants, which would have direct or indirect impacts on such environment. These parties are divided into human being and technical resources. Some of human parties responsibilities have been changed from the ones they were used to practice in classical learning, to new ones in distance education [1][5][8].

Human Being Parties

Human being resources are classified into several categories:

Planning and designing category: includes planners, designers and authors.

One of the major roles of this category is to check the learning system's characteristics, specifications, and functions in order to construct the courseware and mapping such characteristics to be included and presented in the learning model. The courseware is the result of a joint-venture relationship between the courseware designer and the courseware author(s). The role of the courseware designer does not end with designing a courseware structure, but it extends to be in-touch with the courseware author(s). The courseware author can refer to the courseware designer at any stage of the courseware construction process for further consultations or agreements. Beside that, the two parties are responsible for analyzing the courseware profile, which consists of the teacher's recommendations and the student's evaluation. According to those analyses, the courseware might be enhanced in later stages.

Teaching and consulting category: includes teachers, on-line facilitators, and teacher assistants.

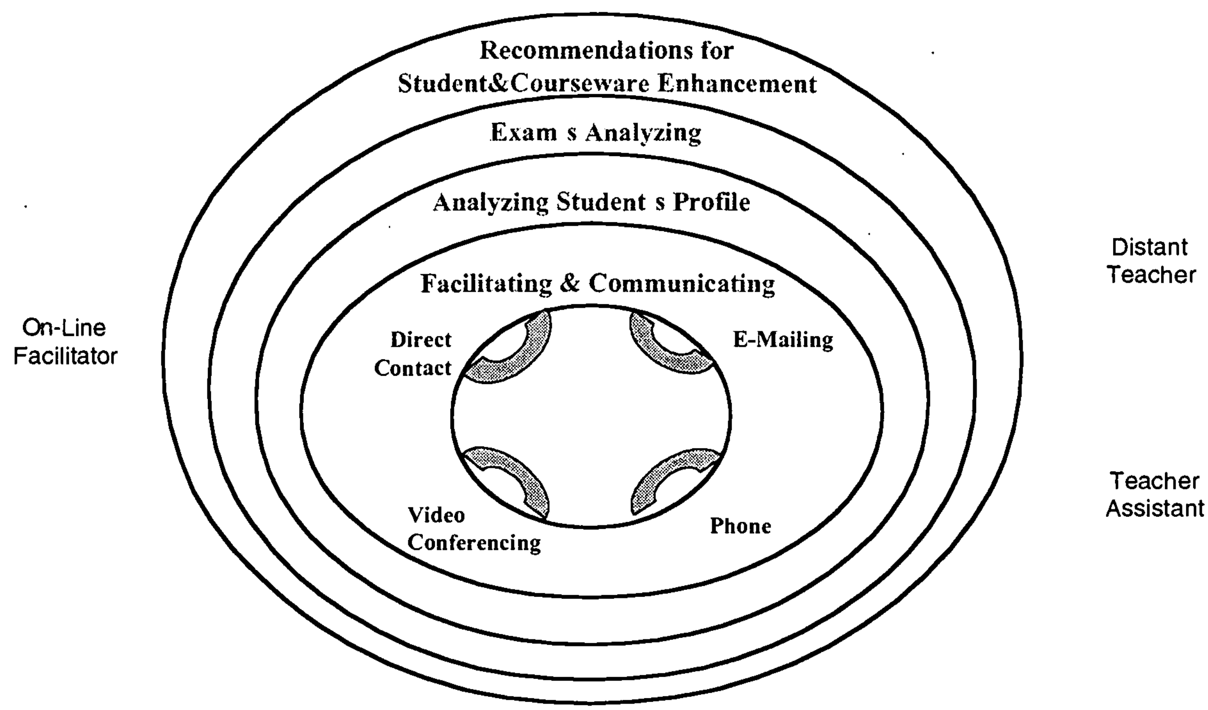

Figure 3. Roles of Teaching and Consulting Category

The distant teacher's roles are very important since he/she is interacting with distant-students through the distance-learning environment, as shown in figure (3). The distant teacher and on-line facilitator are responsible for facilitating students through the learning process, and communicating with them through various kinds of communication mediums such as email, phone, and/or video conferencing [5][6]. Also, distant-teacher is analyzing student's profile and exams in order to evaluate the student's progression, and then express his/her remarks. In addition, distant-teacher and Teacher assistants are participating in exam preparation and grading. Distant-teacher's notifications might be valuable for student's benefits to increase his/her knowledge. These actors have the freedom to suggest recommendations that may lead the courseware designer and/or author(s) to enhance the courseware. This category players are the most actors who interact with distant-students, therefore, They are able to decide whether the student needs further courseware to gain more knowledge or not. Thus, distant-teachers are authorized to offer students access privileges to join another courseware.

Learning and accessing category: includes full-time students, continuing education learners, vocational or seasonal learners and trainees.

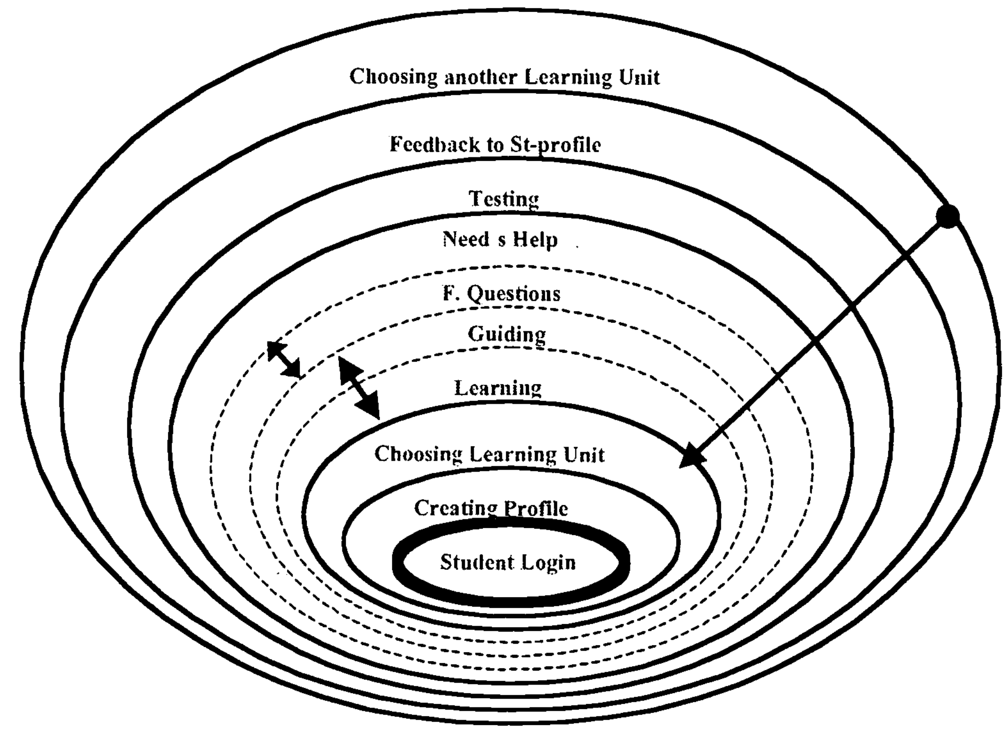

Figure 4. Roles of Distant-Students

In order to achieve the learning objectives in distance learning environment, distant-students must be co-operative and have the sense of responsibility. Also, distant-students have to be aware for their roles during the learning process, as shown in Figure 4. Moreover, distant-student roles begin with creating student's profile including all personal information details needed for joining a courseware and distant-teacher's analysis. Next, the distant-student starts learning by exploring a learning unit(s). Usually, distant-students might encounter some problems during their learning activities or might have frequent questions that are useful for learning actions, so students could obtain help from distant-teacher and/or on-line facilitator. Then, distant-student is ready to take an exam to measure his/her obtained knowledge; meanwhile the distant-student must be aware that this exam's result will be stored in his/her profile. Furthermore, distant-student has the facility of criticizing and issuing suggestions to improve the courseware. Finally, according to distant-teacher's recommendation distant-student can also choose another learning unit/courseware.

Administration and media preparation category: includes systems administrators, media specialists, and data bank and multimedia experts.

These participants are playing important roles in administrating, maintaining and updating the system. Also, they are responsible for extracting, creating and editing the database as well as multimedia objects [1][8].

Development category: includes application developers, HTML programmers, XML programmers, and VRML specialists.

These parties are the key soldiers, who are responsible for making the system alive and accessible for all parties.

Evaluation category: includes GUIs evaluators, systems evaluators, assignment/tests evaluators, and student s performance evaluators.

These parties are providing additional duties, but it is necessary for the success of the system.

Technical Resources

All these human parties are in great need for technical partners to accomplish the distant learning system.

Courseware Database Server

Once a courseware has been constructed and tested, the Database Server will contain the courseware hierarchy, distant-students profiles, presentation structures, and courseware profile to be used by the end-users.

Multimedia Information Server

Multimedia Server is the storage place where the physical multimedia objects are stored to be delivered within the courseware content.

XML Parser

It is used to parse and manipulate the XML objects.

JAVA Virtual Machine

It is a programming tool that controls the developing, execution and accessing of Java classes objects, and then deliver execution results to end-users.

Authoring Tools

There are several commercial packages that are helpful for authoring and constructing courseware [4][7].

Conclusion

Since learning is one of the most important issues in our life, it is necessary to design new strategical models that could combine the theory and technology in order to meet the learning goals and satisfy student s needs. The issue is not only the usage of new technology, but the more important one is how to benefit from these technologies to offer more services and features.

Within distance learning environment, there are a lot of participants that have a great impact on the learning activities, such as systems designers, courseware authors, distant teachers, online facilitators, service providers, media specialists, servers, and distant learners.

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The World Wide Web, Problem-based Learning and Post-graduate Students: The Perfect Match

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Abstract

In the mid and late 1990 s the spread of the World Wide Web within the education and training field was rapid and global. This new technology was innovative and something that was easy to experience first hand. It reached into every education and training sector: from pre-schools to graduate schools and from workplace training rooms to adult extension classes. Teachers, trainers and students all wanted to find out what the Web had to offer them. In this rush to come to grips with the technology, they were forced to confront the issues of cost and speed of Internet access and the rapid way in which the Web was evolving: from new HTML tag sets, new commercial software products and new ways of searching, communicating, collaborating and publishing.

Now in its second decade, attention is being focused on how the Web is actually being used. Evaluation studies are seeking to critically determine the Web s suitability and effectiveness in many areas of application. These studies seek to disentangle the hype from the reality. In the field of education and training Web-based courses are coming under increased scrutiny and pressure to deliver sustainable, high quality and cost-effective learning opportunities. Teachers and trainers are coming under increasing pressure to articulate and justify their selected approaches to teaching and learning, and their choice of educational technologies and resources for use with the specific student populations and for particular course outcomes.

Technologies that are regarded as educational technologies don t exist outside the context in which they are applied. Indeed they are defined by the ways they are utilised within various teaching and learning environments. This paper presents the case for the World Wide Web to be used as an educational technology within the well documented framework of a problem-based approach to learning. It proposes that this technology and this approach, when used with post-graduate students, achieves an ideal match that maximizes learning outcomes.

The World Wide Web, Problem-based Learning and Post-graduate Students: The Perfect Match

Introduction

In one of the most accessed papers on the AusWeb Conference series Web site (HERF 1), Alexander (1995), sounded a cautionary tale about educational technologies .. many adopters of new technologies such as the World Wide Web have as their primary focus, the features of the new technology. These features are then used to provide a learning experience that is often essentially the same as that provided using the existing technologies and, (if evaluative studies are carried out at all) there is surprise when the expected learning gains are not realized. She went on to argue that instead of focusing on the features of the new technology the most important questions to ask are What do we want students to learn? and What is known about the way students learn such things?

Owstron (1997) commenting on the impact and spread of the World Wide Web (the Web) in the mid 1990 s contends that Nothing before has captured the imagination and interest of educators simultaneously around the globe more quickly that the World Wide Web . He goes on to discuss how the Web has been tried out as an educational technology in situations from pre-schools to graduate schools and adult extension courses. He describes much of this activity as simply involving exploration and testing of the Web s capabilities and trying out the Web-related hardware and software such as Webcams for desktop videoconferencing. In some of these trial contexts he suggested that evidence was emerging that the Web has the potential to become a major transforming technology.

Oliver (2001) reports that teaching staff in Australian universities who are involved with Web-based (also termed online) course development and delivery, are increasingly being forced to confront a number of major issues that are at the heart of successful adoption and the sustained use of this new teaching and learning format. He defines four key issues:

- Achieving cost effective solutions. Many of the early moves into Web-based delivery gained high level institutional support by promising economic returns but even after several years of operation, few have delivered clear cost-effectiveness reporting even though some of the strategies for doing so can be identified (Jung & Rha, 2000).

- Achieving and maintain quality. Another justification used to gain early initial support was that courses would be more effective and flexible for learners. Again little comprehensive hard evidence has emerged for these claims and is much needed to counter studies that document the problems students can have with technology and Internet access. Biggs (2001) provides an excellent discussion of the quality issue.

- Ensuring access and equity in the delivery of courses. Again one of the early catch cries for introduction but which on current balance may not be justified. Roblyer (2000) documents this failure.

- Sustaining course delivery. Alexander and McKenzie (1998) document many cases where special funding and project support have been used to initiate both individual courses and complete programs, but are unable to identify many cases were these have moved to mainstream activities surviving with only on regular funding and support.

The scope of this concern is clearly a signal that the time has now arrived for teachers and trainers to take a more critical look at the Web and it role and usefulness as an educational technology.

Defining Educational Technologies

There is an old saying in the discipline of geography that goes something like resources are not, they become . In other words nothing is inherently a resource, it only becomes one when a demand for it arises. For example, if you were stranded on a barren desert island would you consider fresh water or gold to be a resource for you? Clearly in this situation the former is much more valuable to you as it is life sustaining and would be the resource you would be seeking. Of course, if you suddenly realized you were about to be rescued and returned to civilization the next day, then the gold on the island would probably *become* your most prized resource (to take away) from your changed circumstances!

In an educational context there are potentially many items of equipment and software that could become educational technologies: pens and paper, white boards, computers, modems, projectors of various sorts, and telephones are just some of the items that spring readily to mind. Romizowski (1988) even argues that ways of thinking, such as adopting a systems approach to instructional design, can be regarded as an educational technology.

The World Wide Web

The World Wide Web was developed at the international European Laboratory for High Energy Particle Physics, CERN, in Geneva. It came out of a networked information project. Its inventor, engineer Tim Berners-Lee and his colleague Robert Cailliau, wanted to develop a system that would assist physists and engineers to easily locate and exchange electronic documents, reports and papers relating to very large collaborative projects that literally involved thousands of researchers and support staff in various institutes and universities around the world (Berners-Lee, 1999, and Gillies & Cailliau, 2000). They were not trying to develop an educational technology *per se*. What they basically wanted was a document exchange and display system and the method they developed to achieve this involved http server software and a set of HTML mark-up tags. Little did they know that the interim name they selected for their new communications system, the World Wide Web (or just the Web or WWW) would spread so far and so fast, that within a decade it would be commonplace in homes, schools and business environments around the developed world.

To call the earliest form of the Web a version of a Gopher-like system with a relatively user-friendly interface is in the broadest sense correct. Of course the Web has evolved into much more. It has adopted ideas from pre-existing and parallel developments in the hypertext community and spawned many of its own new concepts in the various fields in which it has been applied.

In an educational context what does the Web consist of? There is no simple or agreed answer here. Pose the question to a group of teachers and trainers and you will get a variety of answers. For those relatively new to the field, it is likely to be defined as their current (free) browser which they use to access a course management systems such as WebCT" (HREF 2) or Blackboard" (HREF 3). For editing it is likely to be any one of a number of shareware or commercially available HTML editors or Web page authoring tools of perhaps even a word processor with a Save as Web page feature. Collectively this represents a relatively small set of software tools.

While most teachers and trainers make use of browsers and HTML editors, very few are likely to be involved in setting up or maintaining actual Web servers and courseware management software. In this regard most teachers and trainers are reliant upon some from of technical support to actually serve up their Web pages and for big projects may also require some form of specialized assistance as to how best to organize the material. Information architects are one of a new breed of professionals that offer such services.

For those who have had a longer involvement with the Web, those who have followed its rapid evolution since the early 1990 s, the Web is a much more wide ranging set of inter-related technologies and tools that started with HTML mark-up and line mode browsers. It then moved to a more graphic point and click interface with the introduction of Mosaic, and went on to achieve platform independence with the introduction of Java. Of course there have been many more significant developments in specific areas: XML introduced the idea of a semantic Web, secure socket layers (SSL) provide a degree encryption to allow secure transactions, frames and cascading style sheets assisted layout and stream servers improved delivery options for audio and video, to name just a few.

What does the Web allow teachers and trainers to do that gives it the potential to be used as an educational technology? The Web can:

- ¥ deliver existing content, but content *per se* is not instruction, it is a necessary but not sufficient ingredient of the teaching and learning environment. As you might expect the Web does this very well as it was originally designed to allow users to access documents over the global computer network, the Internet.

- ¥ be set up to handle communication exchanges that can vary from fully public forums, to closed groups, or one-to-one sessions. These can involve various channels including: synchronous (chat) and asynchronous (email) text, videoconferencing or voice.

- ¥ be used to search for information that is available publically or privately. The number of public pages available via popular search engines such as Google, currently exceeds 1.6 billion with individual institutions having pubic sites that can run into the millions of pages. The US Library of Congress has over 7 million items accessible via the Web. With appropriate username and password codes, additional access can to gained to various intranet sites that contain additional private information.

- ¥ be used by teachers and students alike to publish new documents. Indeed the Web allows genuine global publishing not just desktop printing which is really all that desktop publishing allows. Web documents can contain traditional text as well as various forms of other media (graphics, photo quality images, animations, audio and video etc). Furthermore, Web published documents can be easily updated and re-distributed. They can even be linked to live information feeds so that the data the documents display is automatically updated.

- ¥°be used to manage collaborative text and multimedia workspaces that encourage and manage multiple inputs.

- ¥ be used to collect responses and compile and display results. This can involve everything from simple agree/disagree responses to complex surveys. The Web can be used to provide instant feedback for certain types of review or testing.

- ¥ be used as a filing and archival system to securely store private information, notes, drafts of ideas, papers, responses etc.

Having the skills as well as the access to hardware and software needed to confidently undertake all of the above activities, would be rare for students and even experienced teachers. Of course it is unlikely that they will all be needed simultaneously for any given course. Therefore the opportunity and challenge exists to incorporate appropriate levels of Web technology skills training into any course before they are formally required.

Problem-based Learning

Problem-based Learning (PBL) is an approach to teaching and learning that aims at developing a student s ability to function in complex workplace situations and to be able to work in professional environments that involve group or independent work. It seeks to make the process of solving complex real world tasks the principle focus of the students learning. PBL was first developed in response to the apparent shortcomings in student performance once they move from their learning environment to the professional workplace. As such the major focus of PBL is to ground the student s learning in the kind of situations and conditions that they will experience once they enter the professional workplace.

Much of the pioneering work in PBL was done in Canada in the Medical School at McMaster University in Ontario. In Australia, PROBLARC, the Problem-based Assessment and Learning Centre, at the University of Newcastle, provides an extensive on-line bibliography of over 1200 articles on PBL (HREF 4). The School of Medicine at Queen s University in Ontario provides an excellent set of Web-based references in the health and medicine area (HREF 5).

The PBL approach now used around the world, typically involves considerable small group work that aims to foster an inquisitive and detailed look at all issues, concepts and principles contained within a given problem. Students also spend time outside the small group setting and this work facilitates the development of skills such as literature search and retrieval, critical appraisal of available information and the seeking of opinions of peers, specialists and even the general community. PBL encourages students to adopt a degree of self-management and responsibility for their own learning.

In a PBL course of study a set of subject (content) specific objectives are typically followed by additional objectives that relate to the non-content specific outcomes of the course. These might include such additional objectives as:

- ¥ appreciation of the diversity and quality of learning resources;

- ¥ awareness of personal assets, limitations and emotional reactions;

- ¥ responsibility and dependability;

- ¥ ability to relate to, and show concern for, other individuals; and

- ¥ the evaluation of personal progress, that of other group members and the group process itself.

One of the most important aspects of PBL as a teaching and learning strategy is that students need to respond actively to the learning task. In undertaking active responses they engage in thought processes and actions that are required to solve problems. This requires a far higher level of cognitive activity than simply sorting out already collected facts or carrying out a limited number of established procedures (Biggs, 1999). Students must learn facts and procedures in the context of using them to function at higher cognitive levels of analysis and synthesis to reach outcomes that can be applied to real world situations. This view is supported by Laurillard (1993) and Jonaseen, Duffy and Lowych (1993) who argue that knowledge is constructed through the active participation of the learner in trying to arrive at and articulate their own personal understanding of ideas and concepts.

Work by Schank and Cleary (1995) on teaching architectures and computer supported learning environments, identifies several different but partially overlapping learning environments: Simulation-based learning, Incidential learning, Learning by reflection, Case-based learning, and Learning by exploring. All of these suggested architectures can be fitted into the framework of a problem-based approach.

Post-graduate Students

Students who have studied as under-graduates and obtained a first degree have, as well as accumulating foundation knowledge and skills in one or more discipline areas, been inducted into many aspects of academic life. The development of sound study skills involving library research, the analysis of questions, assessing the validity and reliability of information, assignment writing (including the development of a line of argument and how it can be supported via references to the appropriate literature) are examples of some of the academic skills required.

In Australia, most students currently undertaking post-graduate degree studies do so after they have spent some time in the workforce. Most post-graduate degrees involve coursework and tend to offer a selection of coursework elements although some may also offer a small optional dissertation as research training. Post-graduate research degrees, which tend to attract mostly students directly from their under-graduate degree studies, offer very specialized research training.

While some post-graduate students undertake studies full-time on-campus, the majority remain in the workforce and undertake studies on a part-time basis. This may involve on-campus components (evening lecturers or tutorials) or occasional weekend (or week long) residential schools. For many it involves off-campus external study where traditional contact with teaching staff and the institution was via the exchange of paper documents and the occasional telephone call.

Being in the workforce means that post-graduate students tend to have computer facilities and Internet access at work or at home (or both). At work they are likely to have access to some form of technical support via either a knowledgeable co-worker or a designated technical support employee. Post-graduate students tend to be computer literate in at least word processing, email and Web browsing.

Another relatively recent change that has influenced the character of Australian post-graduate education and training has been the introduction of fees. Over the last decade Australian niversities have reacted to the progressively declining government funding by introducing fees for almost all coursework post-graduate programs, from graduate certificates, to diplomas, masters degrees and professional doctorates. Only certain types of post-graduate research degrees are still supported by government funding. The introduction of fees has also meant that many intending students have taken a pragmatic and economic view of post-graduate study by asking the question: Will this course give me immediate workplace skills that will allow me to perform better in my workplace and thus gain promotion or give me the added qualifications to apply for a more senior job? In short, students want to see a return on their investment in the relatively short term.

Teaching and Learning Approaches, Educational Technologies and Post-graduate Students

The issues presented and the situations described in the earlier sections of this paper lead to a single, inescapable recommendation. It is this, that the Web, in the hands for teachers and learners that have at least basic level of computer and Internet literacy and access, is an appropriate educational technology to use within established framework of PBL approach. Furthermore, the characteristics of Australian post-graduate coursework students support the adoption of a PBL approach that makes use of the Web.

PBL is a powerful framework within which the teacher or trainer can structure diverse, interactive teaching and learning activities that require students to interact and apply higher order learning processes. The Web and its associated technologies provide a set of related, educational technologies that collectively make up a networked environment that offers a range of tools: document exchange, search capabilities, and a variety of interactive environments (synchronous and asynchronous). It also provides collaborative workspaces and publication facilities (or text documents and multimedia files) that are ideally suited to the demands of a PBL approach. This means each of the three components is acceptable to the other two and in turn supports the use of the other two. There is an interlocking, reciprocal match.

Conclusion

If adequate efforts are not made to match teaching and learning approaches with appropriate educational technologies and the characteristics of specific courses and student groups, then it is easy to envisage as situation where it could be a case of one step forward for technology and two steps backwards for pedagogy.

A PBL approach that utilizes the Web is ideally suited to the nature of post-graduate programs and the special characteristics and needs of most post-graduate students. It is the perfect three way match.

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Hypertext References

HREF 1 AusWeb conference series papers, http://ausweb.scu.edu.au

HREF 2 Blackboard s homepage http://blackboard.com/

HREF 3 WebCT s homepage http://www.webct.com/

HREF 4 Bibliography of the Australian Problem Based Learning Network, http://www.newcastle.edu.au/services/iesd/learndevelop/problarc/bibliography.html

HREF 5 Queen s University, Problem-based learning home page, http://meds-ss10.meds.queensu.ca/medicine/pbl/pblhome.htm

CanCore: Metadata for Learning Object Repositories

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Abstract

"Metadata", "repositories," and "learning objects" are terms used to describe a new vision for the widespread sharing and reuse of digital educational resources for classroom and distance education settings. The purpose of this paper is to provide an overview of this vision, focusing specifically on the central role of metadata in facilitating the discovery, reuse and management of these learning objects in public education contexts. This overview will begin by introducing the concepts of "learning objects", and the "metadata" that can be used to describe them. The paper will then focus on the Canadian Core Protocol (CanCore) as a ready-made metadata solution with the potential of providing single-click access to distributed educational resources. Finally, it will describe how the Canadian Core can achieve this type of accessibility in the context of a variety of repository architectures and distribution models.

Keywords

Metadata, Learning Object, Repository, Educational Object, Web Gateway, CanCore, IMS

CanCore: Metadata for Learning Object Repositories

Introduction

The difficulties involved in the effective discovery, evaluation, use and reuse of Web resources in teaching and learning now form a familiar litany. Issues like non-searchable multimedia materials, content and quality controls, pedagogical effectiveness, and resource reusability have plagued the development and implementation of learning materials on the Web from its inception. The Canadian Core Learning Resource Metadata Protocol (CanCore), together with special repository systems and more formalized understandings of learning resources or "objects," represents a solution to these problems. This solution involves the reconceptualization of digital learning resources in general as smaller, modular learning objects, systematically described through standardized, searchable metadata, and collected and made seamlessly accessible to users through a system of linked repositories. This paper will provide an overview of this vision, focusing specifically on the central role of metadata and the utility of the CanCore Protocol.

What are Learning Objects?

As the combination of two important terms, the phrase "learning object" designates something that is at once an informational or interactive object and that also has an evident educational application. Derived from the world of object-oriented programming, the term "object" connotes a resource that is modular, reusable, and capable of being integrated with other objects. Although the literature differs on its exact understandings of the modularity and "combinability" (or interoperability) of these objects, it reflects a general agreement on the importance and rationale associated with their reusability: Roschelle and Kaput (1996), for example, argue that conventional "stand-alone applications are incompatible with typical production, distribution, and usage patterns for educational software...." As a result, educators and developers, as a Cisco Systems White paper argues, "need to move from large, inflexible 'courses' to reusable, granular objects that can be accessed dynamically through a database" --theoretically to be shared and reused by any number of users (Cisco, 1999) [HREF 3].

The word "learning" appearing in the term "learning object" implies that such an object cannot simply be a free-floating, decontextualized element of information or interactivity. Instead, to be properly educational, a learning object must have at least one specifiable educational purpose or context. This context can take the form of a lesson plan, a quantifiable outcome, or even a very specific conceptual and technical framework that places the object in a specified sequence or algorithmic "syntax." The more specific conceptual or technical frameworks used to define an object's pedagogical context seem to be of greatest interest to those involved in the design of commercial and military training programs. This approach is well represented in the works of David Merrill [HREF 4], David Wiley [HREF 5], and in systems and specifications being developed by industry players like Cisco Systems, the IMS Global Learning Consortium [HREF 6] and the SCORM initiative [HREF 7]. However, in the public education sector --the area on which this paper will focus-- understandings of the educational purpose and context associated with any learning object tend to be more general and flexible. Besides taking the form of lesson plans or suggestions for educational use of the object, these more general educational "contextualizations" can also be represented by student assignments or questions, or by end-user or peer reviews of the object. In these circumstances, further contextualization is often provided by specifying the learner level, and the curricular or disciplinary attributes that can be associated with the object. As a result, a particular object could conceivably have a number of such "contextualizations", lesson plans or reviews associated with it --each serving the purposes of a different grade level, curriculum, or instructional design.

When understood in these general and flexible terms, a learning object could conceivably take the form of any one of a number of digital media. These media can include Java applets, Flash animations, and audio and video clips; but they can also take the form of more exclusively "informational" materials like Web pages, Web sites, PDF documents, or PowerPoint presentations. Any of these resources could conceivably be used by teachers to augment classroom or online lessons, by students for remedial or independent study, by instructors or designers to construct online courses, or by administrators for purposes of curriculum coordination.

Finally, in discussing learning objects, it is important to mention the question of "granularity". This term refers to the size or the number of sub-components that combine to make a given learning object, and to the relative size of the object itself. For an object to have a specifiable educational purpose, its granularity must not be so "fine" that its educational purpose is unclear or endlessly variable. (For example, a photograph of historical significance could be used in learning or teaching the history of photography, the history of any type of subject matter depicted, or for the aesthetic achievement that photograph itself might represent. But unless it is specified as being appropriate for at least one of these purposes, it would likely remain unassociated, un-classified and thus unused in the case of all of them.) At the same time, optimally the size of the object should not be so large (e.g taking the form of an entire course or program) that it has little potential to be adapted for different instructional contexts and purposes.

What is Metadata?

For learning objects to be effectively shared and reused, a user with a specific need --in a particular subject area, with a given learning level and learning style-- must be matched up with the learning object that would most effectively and efficently meet that need. In addition, this object would in all likelihood have to be identified from a large and varied collection of related resources distributed across a variety of locations.

Metadata promises to accomplish this task by providing a controlled and systematic way of describing each object. In this sense, a collection of metadata elements or a record describes and links to a learning object in much the same way as a library catalogue card categorizes and indicates the location of a book in a library. And because learning objects are digital --i.e. composed of digital data rather than print-- this descriptive data is specifically known as "meta"-data. Like a library card, a metadata record covers a number of aspects of the resource that it is describing. In the case of both types of records, these aspects or parameters can include the resource's content, creators, and format, as well as its location, access rights and any administrative information that might be associated with it (see Figure 1, below).

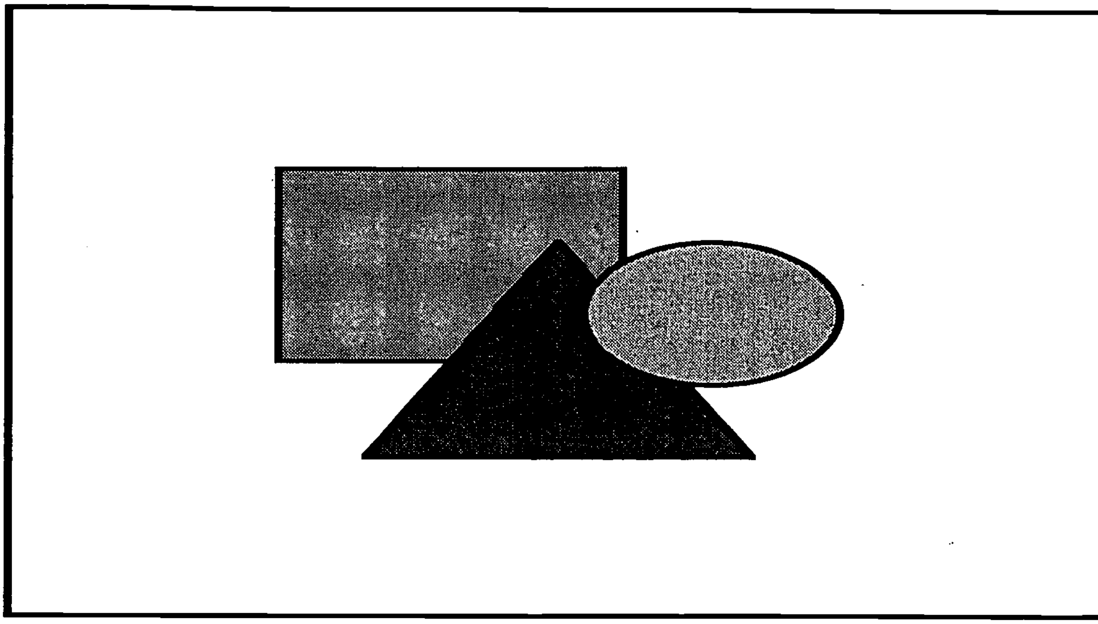

Figure 1: A library card as an example of metadata.

It is also important to understand learning object metadata in the context of more recent developments connected with the World Wide Web and with information sharing standards in general. The Internet and the World Wide Web are exemplary instances of what information standards, when universally and consistently adopted, can accomplish. Anyone who remembers the days of exchanging (often mutually incompatible) files on floppy disks can attest to this. But even though the Internet has provided us with standards such as HTTP, FTP and HTML that greatly facilitate data sharing, it provides no reliable way to search this shared data --especially according to aspects that would be of direct relevance to educators (such as age level or media type). Anyone who has recently searched the Web using a general purpose search engine, and sifted through the thousands of results of questionable value that one typically retrieves, can attest to this fact. This problem is further exacerbated by the expanding use of unannotated, bandwidth-intensive Web-based multimedia. Seen in this context, metadata is an attempt to build on existing Web standards in order to enhance the type of data sharing that these standards already so effectively facilitate. For it is only though structured, consistent and systematically descriptive metadata --and the powerful searching on multiple informational elements that it makes possible-- that the efficient discovery, sharing and reuse of high-quality multimedia learning resources can become a reality.

There are two different metadata solutions or standards that take different approaches to the definition and structure of learning resource description. These are the Dublin Core [HREF 8], and the IMS Learning Resource Meta-data Information Model (or simply, "IMS") [HREF 9]. The Dublin Core takes a "minimalist" approach to metadata definition, and identifies 15 core attributes or "elements" for the description of learning objects and digital resources in general. These include aspects common to a wide variety of digital resources, such as title, creator, subject, description, publisher, contributor, date, and language. However, this "core" does not include any elements identified specifically for the description of pedagogical aspects of learning objects. (Dublin Core has meanwhile provisionally provided six educational "extension" elements. However, these are only at the proposal stage, and a number of them are simply endorsements for the use of elements already identified in the IMS standard.)

The IMS "Learning Resource Meta-data Information Model," on the other hand, takes a "structuralist" approach to Metadata, and provides elements describing an exhaustive set of characteristics that a digital learning resource might manifest. The model consists of about 80 elements, structured hierarchically in four levels to form nine main groups, and 16 sub-groups. Due in large part to the number of major industry players supporting it, the IMS standard has been widely recognized as the leading metadata solution for describing learning objects, and is being used in international repository efforts like MERLOT [HREF 10] and ARIADNE [HREF 11], as well as in the U.S. Department of Defense SCORM initiative. However, it is also generally recognized that the IMS specification has created difficulties for implementers. And this is generally attributed precisely to its descriptive specificity and sophistication. As the IMS itself admits,

> Many vendors [have] expressed little or no interest in developing products that [are] required to support a set of meta-data with over 80 elements. Most have existing products that they hope could support a minimum baseline of elements that the learning resource community would agree to be essential. They also want to be able to make marketing statements such as "IEEE/IMS meta-data conforming document." (IMS, 2000) [HREF 12].

Unfortunately, as of its latest (1.2) version of the metadata information model, IMS has not satisfactorily addressed these concerns (IMS, 2001a) [HREF 13]. Conformance (beyond the level of mere formatting validation) remains something that is still not clearly defined. Exacerbating the difficulties associated with the implementation of this specification is the fact that IMS provides only very brief and sometimes confusing descriptions of the purpose and character its numerous metadata elements. For example, the element labeled "1.3 Catalog Entry" is described in IMS documentation only as the "designation given to the resource", and "5.4 Semantic Density" is characterized confusingly as a "subjective measure of the learning object's usefulness as compared to its size or duration" (IMS 2001b) [HREF 14]. The matter of deciding whether to use such elements and deciphering what their intended purpose might be is no small task. As a result, the actual implementation of the IMS metadata element set is necessarily a complex, resource-intensive undertaking, requiring elements to be chosen, interpreted, used, and then possibly reinterpreted by each group or individual collecting or developing resources. Varying implementations of this element set, moreover, threaten to create problems for the effective searching and exchange of metadata records between projects and jurisdictions.

Consequently, the IMS metadata specification --despite its dominance-- does not represent a "ready-made" metadata solution. Vendors, repositories, and developers cannot yet claim that their objects or collections are "in conformance with IEEE/IMS meta-data" with a clear sense of what that claim might actually mean.

CanCore Metadata

The Canadian Core Learning Resource Metadata Protocol (CanCore) [HREF 15] represents a streamlined and thoroughly explicated version of the IMS element set --a metadata specification, in other words, that is ready for implementation and developer conformance. CanCore has established a core of 36 IMS elements, in effect presenting a third way between the extremes of minimalist and structuralist approaches to metadata represented by Dublin Core and IMS. The CanCore element set is explicitly based on the elements and the hierarchical structure of the IMS specification, but it greatly reduces its complexity and ambiguity. CanCore consists of 8 main categories, 15 "placeholder" elements that designate sub-categories, and 36 "active" elements for which data can be actively supplied in the process of creating a metadata record.

The CanCore protocol includes eight of the nine main categories in the IMS standard: General, Lifecycle, Metametadata, Technical, Educational, Rights, Relation and Classification. Each category and the elements contained in each can be briefly described as follows: The first category, General, describes "context-independent features of the learning object", and in CanCore this category includes seven active elements including title, language, coverage, and an element for full-text description of the resource's content. The second category, Lifecycle, uses four active elements to describe the circumstances of the object's development, including its developers' (and other contributors') names, the date of its creation, as well as publication and version information. Elements in the Metametadata category describe the metadata record itself, identifying those who developed or validated the record, the natural language of the record, and the date it was created or validated. The Technical and Educational categories use 5 elements each to designate (among other things) the object's technical format, size, location and requirements, as well as its educational type, context, and age range. (CanCore also provides a simplified vocabulary for the educational context suitable for an object.) The Rights and the Relations categories employ three active elements each to describe terms and conditions for the use of the learning object, and its relation to other resources. Classification, the last category, consists of four active elements which can be adapted to the use of almost any classification purpose or vocabulary, regardless of the type or the aspect of the object that vocabulary might describe. As one suggested application of this "catch-all" category, CanCore provides a classification and vocabulary for granularity (or pedagogic type) to designate the object as a "program", "course", "unit", "lesson" or "component".° (See [HREF 16] for more information about the metadata elements included in the CanCore Protocol.)

The simplifications and interpretations provided in CanCore already save users the task of selecting and coordinating the use of metadata elements to achieve a basic level of interoperability. In this way, CanCore has already realized considerable economies of scale for its users. It has already worked to prevent redundant or inconsistent implementation efforts, and to ensure that educational metadata and resources can be shared easily among its users and with IMS implementations internationally. As of the writing of this paper, the CanCore Protocol is serving these ends in the context of a number of national projects that are currently developing learning object repository services.° These include the CANARIE-supported "Portal for Online Objects for Learning" (POOL) [HREF 17] and "Broadband Enabled Lifelong Learning Environment" (BELLE) [HREF 18] projects, as well as the Alberta Learning Portal. Funding and support for the development of the CanCore Protocol has been provided through these projects, as well as by the Netera Alliance, TeleCampus.edu, the CAREO Project, and the Electronic Text Centre at the University of New Brunswick.

To ensure that further coordination and economies of scale can be realized, CanCore is developing a comprehensive guidelines document. This document is based on two existing implementation documents or application profiles (see: [HREF 19]), and will provide interpretations for the precise meaning and use of each element included in CanCore. In addition, CanCore is planning to provide training and further vocabulary recommendations, as well as other support and coordination services. Together, these products and services promise to realize further economies of scale, and to make possible an even higher level of interoperability between vendors, developers and repository efforts. In this way, CanCore has added and will add considerable value to the IMS standard, allowing developers and vendors to make clear and confident marketing claims about conformance to CanCore metadata specifications.

Repository Architecture & Metadata

To understand the workings of the seamless, single-click access that is promised by CanCore, it is important to envision how CanCore-compliant records will be integrated into a number of repository architectures and distribution models. These architectures and models fall into two paired classes: A centralized architecture and a commercial or for-profit distribution model on the one hand, and a distributed architecture, and a public or open distribution, on the other.

Typically, a centralized repository architecture combines both learning resources and the metadata describing them in the same location -often on the same server, but at least subject to the same central administration. This centralization provides the potential for exercising significant control over the distribution and availability of the learning objects housed in such a repository. As a result, a centralized architecture would likely be most suitable for vendors of commercial content, such as textbook publishers who wish to control access to their educational resources or assets. It is important to note, however, that this control and management would take place in a layer that is separate from the metadata. Such control and management "layers" or systems are available from third party providers. However, the CanCore Protocol --like the IMS specification-- provides data elements that indicate the presence and nature of such rights controls, and that describe commercial status and even the price of the object under consideration.

For CanCore to make seamless search and retrieval a reality in the context of this centralized architecture, it is essential that the metadata records describing the educational assets are themselves not subject to any access or rights restrictions. These metadata records --unlike the assets themselves-- must be made openly available in an interchangeable format to other repositories or collections of similar metadata records. Such a format for interchange is provided by XML (eXtensible Markup Language). CanCore will be providing IMS-compliant specifications for creating and verifying such interchangeable XML records. These interchangeable descriptions can then be seen to serve as digital "calling cards" for the commercial assets they describe, exposing the products to wider markets and the users of any number of learning object repositories.

A distributed architecture provides an alternate method of organizing learning objects that seems especially well-suited to the interests of public sector repository projects, and to larger collaborative efforts. Just as commercial content providers have been deploying distribution control mechanisms for their products, public sector educators --taking their cue from the academic research and open source communities-- have been implementing practices for openly sharing and developing high-quality educational resources. For example, the MERLOT project has adapted the practices of peer review of faculty research as the basis for encouraging the development, evaluation and reuse of learning objects for postsecondary teaching and learning. At the same time, in its highly publicized OpenCourseWare initiative, the Massachusetts Institute of Technology has taken the open source software development model as the basis for making many of its own course materials freely available on the Web for public use and collaborative development --all with the ultimate expectation that the initiative "will raise the tide of educational innovation within MIT and elsewhere" (MIT, 2001) [HREF 20].

Germaine to these types of open, collaborative approaches would be a repository architecture that is itself distributed and cross-institutional. The efforts invested in the development, implementation and review of the objects would likely be scattered across many institutions.° In the same way, the objects themselves would be distributed across the Web, in locations provided most likely by their developers or supporters, or their sponsoring institutions. The metadata describing these resources, however, would remain centralized for fast and effective searching, sharing and control. This would allow the resources to be updated and otherwise maintained by their owners while allowing the metadata describing them to be shared and searched. This type of mechanism --perhaps more accurately described as a Web gateway than repository (see the DESIRE Information Gateways Handbook; [HREF 21])-- is being developed by the BELLE and POOL projects (using the CanCore scheme itself), and has been implemented in MERLOT (using a CanCore-friendly IMS interpretation).

As in the case of a centralized architecture, in a distributed repository model, metadata records describing the resources are in every instance freely available for interchange. Whereas the records created in a centralized, commercial model would typically be generated by the agency owning the assets, the records in an "open source" distributed repository would likely be created by those individuals who develop or contribute objects. Because these individuals would not likely be trained in classification or indexing, support documents and quality control procedures would have to be provided for the development of this metadata. Both the processes of quality control and the creation of records by non-specialists would be facilitated by the relatively small number and simplicity of elements available in CanCore, and by the explication and interpretation CanCore provides. Again, these metadata records would serve as a type of "calling card" for the resource, providing the original developer with favourable exposure to a community of peers, and allowing any resource to be used, reused and potentially improved.

The free interchange of these records among commercial and public repositories opens the way for a third type of repository approach --one that is derivative of the distributed model outlined above. This type of repository can be characterized broadly as "a repository of repositories". With metadata records both freely available and exchangeable, it is possible to envision a collection of metadata that would actually be independent of any collection of assets or resources. In this case, these records would refer to resources available in any number of other centralized or distributed collections, and would provide the user with a single place for searching and accessing these resources, regardless of their point of origin. When a user searches such a central metadata store, she would be able to get single-click access to resources that are otherwise scattered across the Web, in proprietary and public databases that may have a variety of access protocols and paths. When combined with customizable news, community-building features and other services, the aggregation of material presented in such a context would truly earn it the title of "portal": a starting point for educational users of the Web.

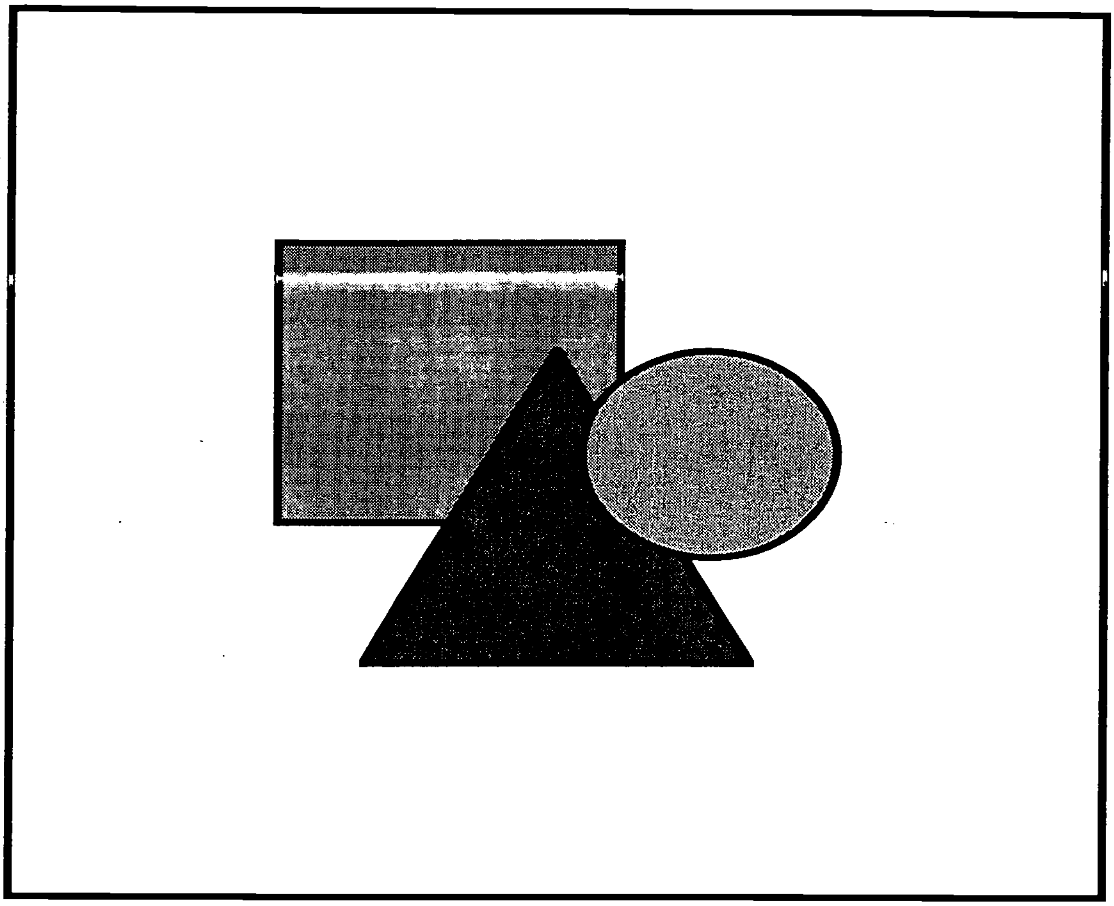

Figure 2: Learning Object Portal Architecture

A diagram (Figure 2) schematizing these repository types and their possible interrelation is provided above. An effective way of understanding the operation and efficacy of these types of repositories is, again, provided by practices that are commonplace in the library world --namely, in the form of a "union" catalogue, and of similar information resource sharing networks. A union or consortium library catalogue represents an aggregation of interchangeable records describing resources that are available across an entire library system or consortium. Such a catalogue would be the functional equivalent of a "portal" or "repository of repositories" described above. Moreover, because the creation of these standard and interchangeable records in the library world is recognized to be a very labor-intensive process, libraries rarely create their own cataloguing records from scratch; instead, they have developed a network where these records are shared. Whenever a library receives a resource for which there is no record, the library will create a new one and add it to the shared record pool, making it available to others only for the price of participating in the network. Similarly, the effective sharing of metadata records among repositories could realize considerable efficiencies, save effort, ensure accuracy, and greatly increase access for users and exposure for vendors or developers.

Conclusion

Interoperable metadata, consistently and systematically implemented, is one of the lynchpins in achieving the vision of easy access to shared and reusable learning objects. The CanCore Protocol promises to provide this crucial functional element for those using it in their implementations. As has hopefully become apparent in this paper, the interest of CanCore is not to compete with or supplant other specification efforts. Instead, its goal is to add value strategically to the widely accepted but difficult metadata model put forward by the IMS Consortium. CanCore adds value to this model by simplifying and refining it, by developing vocabularies suitable to a number of educational sectors, and also by providing interpretation and support in the form of guidelines and other services. In this way, CanCore is attempting to position itself not as an "authoritative" metadata solution, but rather as the solution that is the easiest to implement, and potentially the most strategically attractive to developers, administrators and educators alike.

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HREF 2 http://www.careo.org/

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HREF 10 http://www.merlot.org/

HREF 11 http://ariadne.unil.ch/

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Java Applets and Mathematics

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Abstract

During the last several years the Department of Mathematical Sciences at the United States Military Academy has significantly increased the use of technology in the classroom. Students have and use the TI-89 calculator as well as Mathcad 2000. These advances can increase a student s ability to learn objectives and concepts presented in our Discrete Dynamical Systems and Introduction to Calculus, and Introduction to Calculus and Differential Equations courses. These tools, however, have an associated cost. Students must learn the hardware and/or software while trying to grasp new course material. To minimize the effect of this cost I have found it beneficial to use applets in classroom demonstrations and allow cadets to use them in completing homework problems. These applets are dynamic and do not have the syntactical or procedural stumbling blocks associated with most programs or textural material. Students can begin exploring and learning immediately.

Java Applets and Mathematics

Introduction

During the last several years the Department of Mathematical Sciences at the United States Military Academy has significantly increased the use of technology in the classroom. Currently students have and use the TI-89 calculator as well as Mathcad 2000. These technology advances can increase a student s ability to learn objectives and concepts presented in Discrete Dynamical Systems and Introduction to Calculus, and Introduction to Calculus and Differential Equations, the first two required freshman level mathematics courses. However, these tools have an associated cost for the majority of students who must learn the hardware and/or software while trying to grasp new course material. Informal surveys of students repeatedly indicate this to be perceived as detrimental to learning. To minimize the effect of this cost on the learning process I have found it beneficial to use applets in classroom demonstrations, and to allow students to use them in completing suggested problems. This does not free them from the responsibility to learn the hardware/software; however, it does equip students with tools to immediately focus on concepts and learning objectives.

Mathcad and the TI-89 brought a wealth of power and benefits to both the instructor and student. For the instructor, both enhanced classroom demonstrations. Mathcad made it much easier to graphically show the effects of modifying parameters of an equation. Attempting to accomplish the same with a blackboard and/or transparencies is a futile effort. We found much the same was true for demonstrations with the TI-89. However, the TI offered a bigger plus. Rather than simply watching what was done in class students could follow along and see the results on their screens. Because all students had access to these tools in their rooms, in theory they could repeat classroom demonstrations or explore further on their own.

What does a student do who does not have a TI-89 or an expensive computer algebra system such as Mathcad? Or what about the student who does have access to these resources but cannot remember the "key stokes" or correct syntax used in classroom demonstrations? Do they wait until the next class? More often than not, these procedural and syntactical stumbling blocks, and lack of resources become barriers to studying and self-motivated learning. Given that more than 50% of college students will be able to access the Internet from their dorm rooms and 80% or more will have access from some campus location(s) (Half of US College Students Prepared to Surf Internet, 2001). A viable solution may be applets.

Why Applets?

An applet is a program designed to be executed from within another application. (Webopdedia Definition and Links, 2001) Our applets are written in Java and executed in a Web browser. Why applets? My primary reason for using applets is to eliminate the startup costs and stumbling blocks associated with technologies such as TI-89 and Mathcad. Instructors can focus on concepts, modeling, and problem solving instead of teaching the syntax of Mathcad or the keystrokes of the TI needed for procedural computations. Since there are no syntax or key strokes to learn students start using and learning immediately. Moreover, learning concepts or lesson objectives are not by-products of having mastered certain software. In discussing this with students, one of the recurring complaints is the large amount of time required to become familiar with the software as opposed to understanding concepts. Students also say that they are more likely to use applets outside of the classroom since they do not experience the difficulties of having to learning a new program or procedure.

The Benefit of Java

By definition Java is: A simple, object-oriented, network-savvy, interpreted robust, secure, architecture neutral, portable, high-performance, multithreaded, dynamic language. (Sun Microsystems, 2001) In the education arena instructors can capitalize on the portable, and dynamic qualities of the language. Unlike the TI-89 and Mathcad, Java applets are not tied to a specific software package or computational device. As long as a student has a PC, access to the Internet/Intranet, and a Java-compliant Web browser such as Netscape Navigator or Microsoft Internet Explorer they can use applets. Whether students have a Windows, Macintosh, Unix or other operating systems, they can access and use the same applets demonstrated in the classroom. Another very important feature of applets is that they can be very dynamic. Rather than discussing what would happen as a parameter changes, instructors can show what happens instantaneously. The Graphical User Interface (GUI) of each applet can be designed so that users can easily modify parameters and/or variables and immediately see the results. Easy to use features enable students to perform what if analysis.

Classroom Demonstrations

Two of many applets we developed and used with great success were: "The Army vs. Navy: The Long Trip" and "Harmonic Oscillator." Both are dynamic, interactive, computational, and concept illustrating. (Kamthan, P., 1999) These applets offer numerous benefits that cannot be achieved through traditional, pedagogical methods. Course texts, transparencies, and blackboards are good resources, but they are not dynamic. These applets are extremely dynamic. Users may manipulate several parameters and instantly see numerical and graphical solutions. The interactive features coupled with dynamic visualizations significantly assist students in understanding objectives and concepts.

Example 1: Army vs. Navy: The Long Trip

This applet was developed based on a situation that relates to all students at West Point. Therefore it has noteworthy advantages over other applets because little time is needed to explain the usefulness of the material or give a "real-world" application. Lessons that focus on the slope of a tangent line as the limiting value of secant line slopes, and instantaneous velocity as the limiting value of average rates of change are excellent venues for this applet. Our text, *Calculus: Concepts and Contexts* (James Stewart, 1998) does an outstanding job of presenting this material; however, to refer students to the examples in the text or construct drawings during class does not have the same impact as using an applet. The dynamic nature of this applet allows students to see real-time what the instructor or text describes or attempts to show via many static visual aids. Stewart uses six drawings in an attempt to drive home this idea, and that still may not be enough.

The dynamic nature and "point and click" capability of the GUI eliminate the need for countless static diagrams and/or long word descriptions. A great demonstration or exercise to illustrate that the limiting value of the slope of secant lines is the slope of the tangent line was achieved with the Army vs. Navy applet. Some of the requirements and questions posed to students were:

Set t_1 at 3.5, t_0 at 0.5, and use the applet to generate a numerical solution for the slope of the secant lines as t_0 is increased by 0.5 to 3.5.

Describe what happens to the slope of the secant lines as t_0 increases to t_1?

What does this mean?

An in-class demonstration begins with setting t_1 at 3.5 and t_0 at 0.5 as shown in Figure 1. We point out that the applet provides the average velocity between t_1 and t_0, the slope of the secant line, and the instantaneous velocity at t_1, the slope of the tangent line.

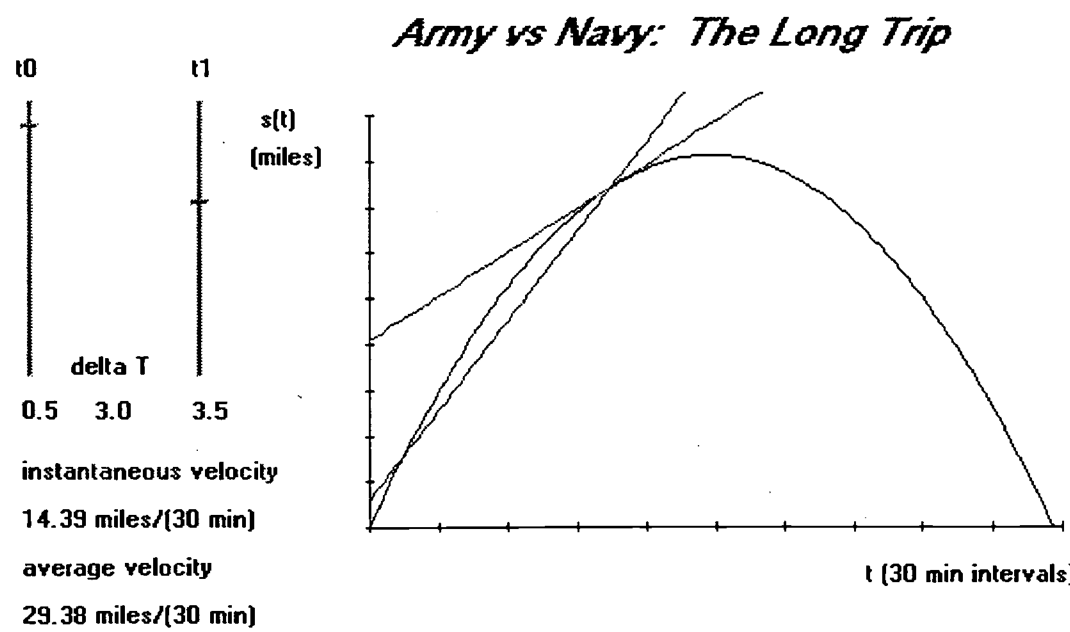

Figure 1: The Army vs. Navy applet shows the difference between the average velocity and instantaneous velocity when t_1 = 3.5 and t_0 = 0.5.

Generating data for a numerical solution is only a point and click away. Users simply "point and click" the t_0 slider and increase its value. Figure 2 shows one of the many instant views with data for the average velocity.

Figure 3 shows the applet when $t_0 = t_1$. The slope of the secant line equals to the slope of the tangent line; the instantaneous velocity equals the average velocity.

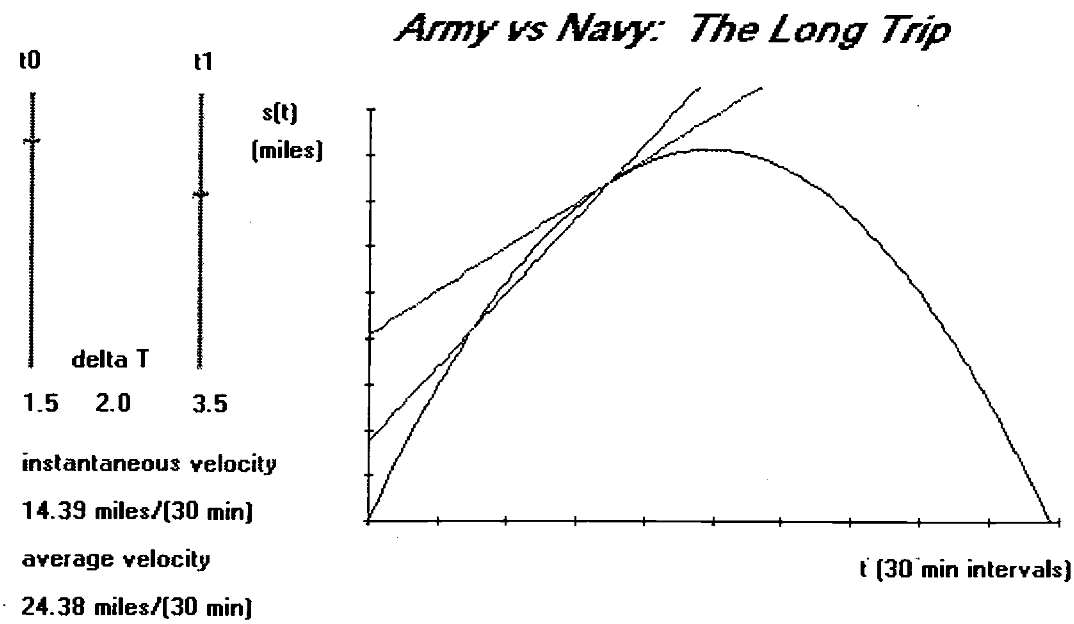

Figure 2: One of numerous real-time pictures a users sees as the value of t_0 is increased to t_1.

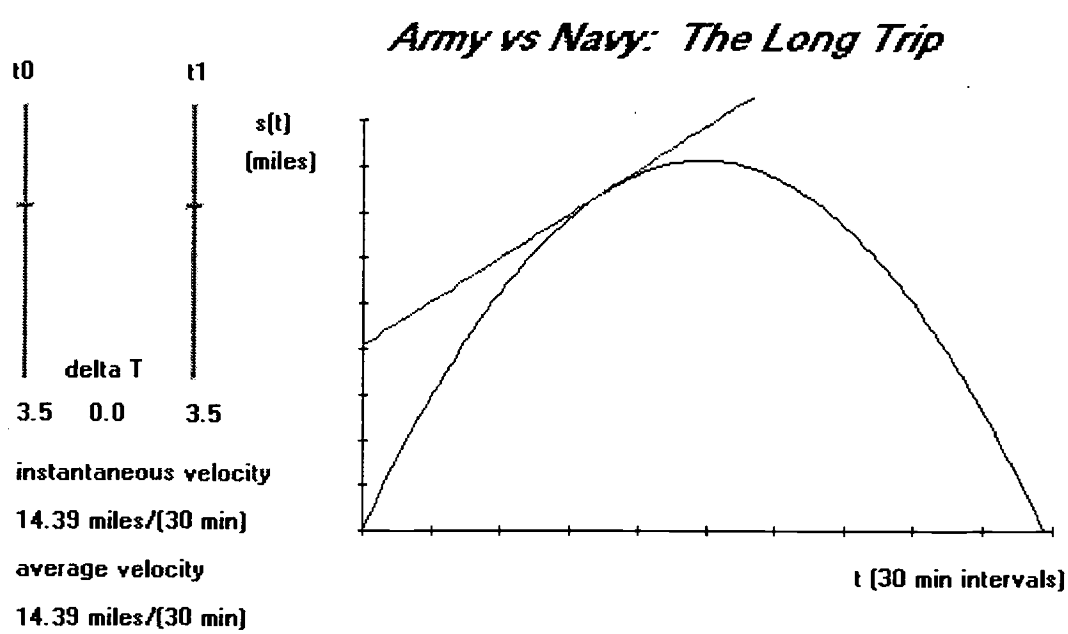

Figure 3: The Army vs. Navy applet illustrates that the limit of the average velocities is the instantaneous velocity when t_1 and t_0 equal 3.5.

The numerical solution coupled with immediate visualization and an opportunity for hands-on training is a complete package for presenting this material and as an out-of-class resource. The in-class demonstration or exercise allows students to successfully watch and understand, and they can repeat it during out-of-class study via "pointing and clicking." While it is possible for students to accomplish something similar with Mathcad, they must create a graph, Mathcad sheet, and manually change parameter values. How much of a student s study time does this require? Even when a "Quick Sheet" is available, there is the potential for invalid entries or frustrating syntax errors. These stumbling blocks do not exist with this applet.

Example 2: Harmonic Oscillator

The harmonic oscillator is introduced in our Calculus and Introduction to Differential Equations course. Students become familiar with modeling harmonic motion and finding the solution to the second-order differential equation that models this phenomenon. Explaining the qualitative behavior of the different classifications of oscillators is somewhat difficult without a vibrant, real-time graphing capability. We have found that the Harmonic Oscillator is a valuable tool for presenting the graphical solution as well as the relationship between roots of the characteristic equation, eigenvalues, and classification of the oscillator. Mathcad and the TI cannot provide this level of user interaction and instantaneous visualization to such a large audience of various platforms and operating systems. An outstanding resource in the mathematics classroom but this applet is not limited to our study of mathematics. It is quite possible that it would be beneficial in the study of simple capacitor and inductor circuits in Physics or Electrical Engineering, or vibrations in Engineering Mechanics.

Lessons on harmonic oscillators require an understanding of the classification, relationship between classification and eigenvalues, and the ability to describe the long-term behavior (LTB) of the harmonic oscillator. Below is a excerpt from an out-of-class exercise.

The accompanying table shows differential equations with initial conditions, initial value problems (IVP), that model harmonic oscillators. Complete the following requirements.

Solve each of the IVPs listed in Table 1.

Classify each of the oscillators.

List the eigenvlaues.

Describe the LTB.

What relationships do you conjecture between classification, eigenvalues, and LTB?

Use the Harmonic Oscillator to check your work.

IVP $my'' + by' + ky = 0,\ v(0) = v0,\ y(0) = y0$	**Classification**	**Eigenvalues** λ1 & λ2	**LTB**
$y'' + 5y = 0, v(0) = 4, y(0) = 4$			
$y'' + y' + 5y = 0,\ v(0) = 4, y(0) = 4$			
$y'' + 6y' + 8y = 0,\ v(0) = 4, y(0) = 4$			
$y'' + 6y' + 9y = 0, v(0) = 4, y(0) = 4$			

Table 1: Students are asked to complete this table and then check their work using the applet.

Figures 4 and 5 show the applet when parameters for the first and second equation of Table 1 are used. Students point and click as needed to explore changing the parameters of the second-order equations. Figure 5 shows the effect of changing b from 0, as in Figure 4, to 1. With every click users are provided classification, eigenvalues, and a plot of the mass position.

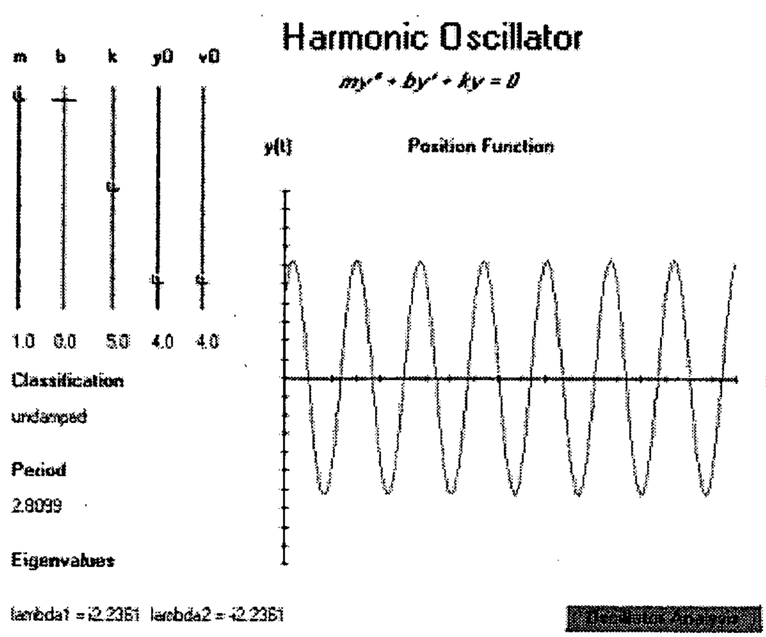

Figure 4: The Harmonic Oscillator applet with the parameters of the IVP,
$y'' + 5y = 0$, $v(0) = 4$, $y(0) = 4$.

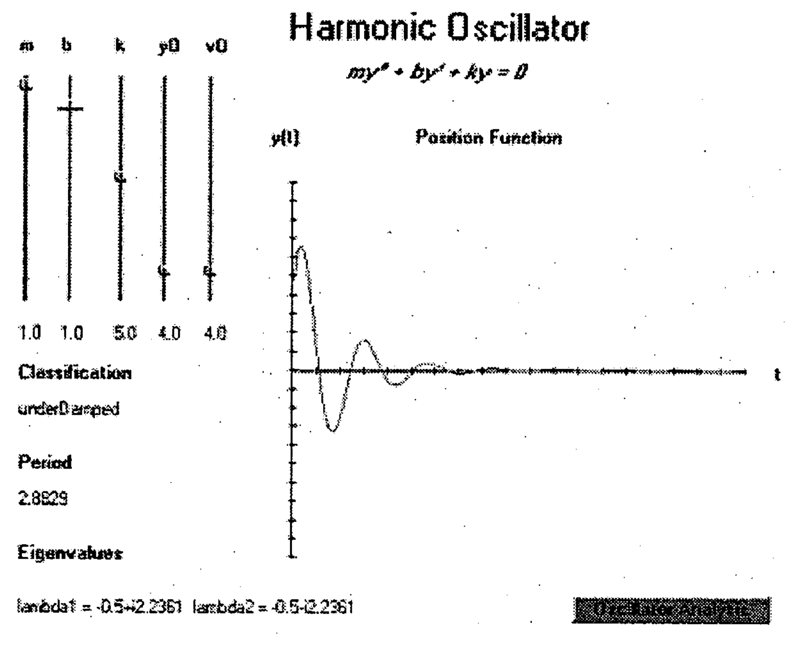

Figure 5: The Harmonic Oscillator applet with the parameters of the IVP,
$y'' + y' + 5y = 0,\ v(0) = 4,\ y(0) = 4$.

This applet is exceptionally robust because it provides additional information to illustrate and reinforce concepts. Figure 6 shows how selecting the Oscillator Analysis button causes a window to appear that discusses the qualitative behavior for the current set of parameters. This immediate feedback is provided on user demand via an error free process and does not require the investment in valuable study time to prepare a learning tool.

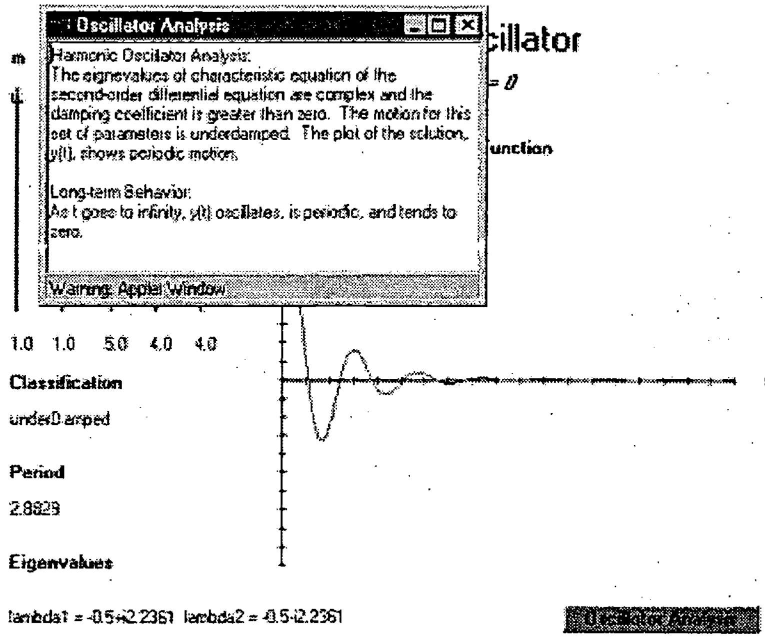

Figure 6: Students may select the Oscillator Analysis button for assistance in completing or verifying their answers to exercises. A window appears that discusses the qualitative behavior of the oscillator.

Out-of-Class Study

During out-of-class study students can access these and other applets to reinforce concepts covered in class. This also presents an opportunity for exploration and discovery. While the basic objectives and concepts are covered in class, using applets allows students to explore related concepts on their own without syntactical or procedural obstacles. This freedom to investigate fosters a deeper understanding of the material and more importantly aids students in learning how to learn. Another beneficial feature of applets is that they are available whenever a user has access to the Internet. Whether in their room, a study partner s room, the library, or the department s mathematics clinic students can gain access. Imagine the possibilities if students had laptops with wireless access to the Internet!

Developing the Technology

A realistic and significant drawback can be the development of these tools. There are numerous applets available on-line; however, we felt few were suitable for our needs. Some did not illustrate objectives in our courses while others were merely animations and lacked user interaction. We prefer applets to be extremely dynamic and interactive. There was also a lack of support for courses like Discrete Dynamical Systems so we chose to start from scratch. Developing, authoring, and packaging for deployment and presentation can be time-intensive and require significant human resources. Applets developed for our curriculum, including those discussed here, can be found at our department's Web site at URL:

http://www.dean.usma.edu/math/research/mathtech

Benefit Realized

The use of this technology is still relatively new and we have not conducted formal evaluations of its use in our classes. In class surveys have been very promising. We feel that a realistic measure of success are the opinions of students who have been instructed using these tools. Students made the following comments:

I think the applets helped a lot. This is especially true for the definition of the derivative. Visual explanations of why things work are very useful when trying to understand something that may not be clear.

The applets of the Web site seemed very helpful. The capability of the graphing calculator was somewhat limited. Since the applet helped me understand the basic principles behind certain problems.

I believe that the applets were the key to my understanding the derivative. The two different views allowed me to visualize the derivative and the graph of the derivative in relation to the graph of the function. It was also helpful to use when studying because I was able to substitute values into the fields to see the graphs of other functions.

I think the applet that showed the tangent line as the limit of the secant line was very helpful. I did not use them often but until I did use it I did not understand the concepts as well.

Applets give you a picture of what is going on so you can understand what is going on rather than just memorizing things.

Some people had trouble telling the difference between average velocity and instantaneous velocity without this applet [Army vs. Navy].

These [applets] were very useful. They were like computer aids that said in three pages what the book said in ten.

The applets allowed the instructor to show how something behaved visually and could follow up with examples quickly and answer questions with graphs.

Student comments provide a wealth of information about the benefits of using applets in the classroom. For starters students are actually using these tools out-of-class to prepare and/or reinforce material instructors presented. Also the dynamic nature of the applets is providing more information or a useful a transformation that allows students to see and understand concepts. And perhaps most important is that students understand the concepts. They are not button pushers who become ineffective without the use of a computer algebra system or calculator.

Conclusion

The TI-89 and Mathcad are truly outstanding; however, they cannot match the capabilities and possibilities available with Java applets. The dynamic, interactive and portability features of Java make it an ideal tool for the development of applets for classroom demonstrations and out-of-class resources. A limiting factor is the availability of human resources for authoring, developing, and packaging, or search for appropriate material. Given the increasing emphasis on technology and interest to integrate numerous disciplines, this may be a limitation worth overcoming. The true measure of success may be the benefit realized by the client, the students. We should take the necessary steps to eliminate obstacles to their learning. The use of Java applets is a necessary step.

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The use of open and distance education in facilitating changes in managerial development: the Mexico experience

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Abstract

This paper examines influences resulting in changes in managerial training and development with particular reference to the University of Guadalajara, Mexico. It starts by examining conditions at the macro and micro levels that bring about change, the nature of change, and the present and future education and training implications to increasing demands on management within diverse organizational environments that are becoming more complex and uncertain. Technology is playing an increasing role in management education and training. Through the use of open and distance education technology learners have greater flexibility of time and place of learning. In addition, where transdisciplinary approaches are used it is leading to the development of "new types of managers" with abilities, behaviors and values that better enable them to cope. Examples draw on management training institutes in Mexico.

The use of open and distance education in facilitating changes in managerial development: the Mexico experience

Introduction

A sign of the current times is the continuous change, which is modifying everything. This constant change drags the transition of modern organizations toward the manifestations of posmodernity, which are expressed in individual behaviors integrated by means of technological processes in the same structures. Two new variables enter in scene to define the posmodernity of organizations: their complexity and uncertainty of environments in which they are immersed.

The pace of this dramatic organizational change accelerates exponentially every time. It leaves as a a consequence an enormous human insecurity in the face of structural rigidity of economic, social, political and cultural institutions. These institutions are unable to absorb uncertainty derived from changes, hinder instead of facilitating adaptability of people and also hinder the use of benefits. These benefits can be derived from the great wave of technological revolution of information, which has become a self-transforming movement and transformer of development opportunities and human progress. Although these opportunities are increased it is also evident the increase of threatening phenomena which deepen the feelings of human fragility and insecurity. These propitiate the uncertainty that encourages the traps and dangers of mankind survival.

MACRO Changes in the global environment of the business community are the result of:	MICRO Impact on individual managers which leads to:	FUTURE IMPLICATIONS Alternative approaches to managers
Productivity improvement of business	Information overload, demand for a greater continued absorption of knowledge	Local continued education/ Formal/informal distance learning
Globalization of business relations	Time compression	More concentration on personal development
Economic and technological changes	Fast changes of leadership and organizational fluid styles	Changes in careers, early retirements
Turbulence	Change requirements for administrative staff, bigger and earlier responsibilities	Reduced activity/ without movement

Table 1: Some ways in which the future can be visualized.

The manager of the future, the future of management

The problem of that, as much the individuals as the organizations take advantage of the opportunities that provide this pace of accelerated change, it is reduced to its control and handling. It finds its foundation in the premise of planning changes, as the theoretical sustenance of organization development that aspire to the transition toward the new times marked by posmodernity.

Organizational transitions respond to the current expressions of tendencies toward the globalization and internationalization of the markets. These trends have appropriated the advances that the technological-computer science revolution provides. Meanwhile, society is more active, more participating and more demanding of better conditions. There are nowadays, bigger demands for human development and quality of life, greater social justice, formation of cultures that respect diversities, propitiate its solidarity and recognize the human rights.

Professional development in management takes into consideration not only, the emphasis of traditional curricula oriented toward assimilation of knowledge in administrative technology, but also development of the abilities, skills and required competencies for instrumental implementation of changes. But above all, a professional manager development that responds efficiently with attitudes and values as a foundation of practices to face the challenges demanded and required by derived situations of an environment characterized as complex and uncertain.

Instead of developing their work —doing it better, to end up being more experts and able — the managers will have to be achievers. They will be able to look for and to command resources, to determine strategies and to break limitations for implementing them. Instead of concentrating on the consistent use of management systems, company policies and rules, and to focus on high standards, they become operative: operators with a group of values, principles and models, but operators in spite of everything, motivated by will and ability to achieve.

Is it reasonable to ask, to achieve what"? But the answer to this rests in the future; this future that, without a doubt, will it include the means to make better use of any available resource for us, to improve the quality of life, and therefore our growth and development. The manager of the future clearly has to be, like it was said previously, a good operator, a motivated person that can obtain and to control class resources to achieve results, a highly developed administrator and highly self-confident.

This person can be among the graduate of high ranks at universities. Until universities again can teach an action theory, it cannot be found this developed human being, in such a way that it has to be developed. In other words, the development of managers will become, much more than a necessity of survival as it is now.

To speak of manager development implies a change in education, in such a way that this is the result of experiences, not training of the memory. Education will be a creative-innovative process, (that some futurologists identify as the characteristic feature of a new phase of the technological revolution that we live in our days) in which the manager is able to develop trust, ideas, communication and interaction.

The Japanese Companies take to practice the following process, according to Raymond (1988):

- What have learned and toward where it can take this knowledge.
- How the previous knowledge could be incorporate and to be applied to the mark of a new position.
- How it can improve a new situation when continuing ahead.

This process should also be incorporated to our organizations, because with it not only is learning continuously, but rather also it is a process of thinking and increasing the knowledge foundations, all the time, as well as applying new knowledge to the same one, and advancing toward the leadership.

The above-mentioned helps us to manifest that the education should exist for the reality and for the future.

From an organizational point of view it is necessary to have, a bigger demand of administrators who will be able to cooperate, and therefore, with abilities of leadership. From the individual point of view, the manager will have more up to date knowledge.

As it was previously signaled, it is evident the existence of unavoidable revolution in managerial practices that have global impacts and that modify all the organizational variables: behaviors, structures and technologies. The current generation of professional managers has been called to be educated in the keyboards .

One of the many ways to increase the wealth of those administrative practices, are the learning outlines at distance which have been developing some universities and other institutions until the level where the abilities and competencies of management can be self-taught. With the use of special text materials, exercises, videotaped examples, use of electronic mail and platforms, the learning responsibility can be broadly transferred. Experiments have shown that the tutor's contact can be designated successfully outside of the programs and that the assignments of tasks can be determined in such a way that a self-assessment and self-evaluation is possible.

With implementation of telematics, education was adapted to the constant change operating in organizations, giving place in this way, that education process does not center around the previously established relationships between the teacher and the student. Thus, more emphasis is given to the link between the information that receives the student and the same student. In this form, the learning process is redefined.

Lack of personal interaction can be a deficiency, but at the same time can be replaced by more modern techniques of interactive video. This allows the student to interact in managerial events on the screen and then to ask, to explore, to answer and to make decisions watching the results of his conclusions displayed in front of him. This is similar to a flight simulator where the training pilots can prove their flight skills without risking. The manager can prove different methods in any kind of problem without being exposed, in a short period of time and space.

With distance learning education, transfer of control of teaching-learning process is given to the individual; this decides what he/she needs to know and then he/she makes the best use in the available learning resources for him.

When being developed continuous education technology it is impelled more and more and designed by the individual adapting it to his own desires and necessities, motivating this way his self-development. Some approaches of this self-development are beginning to emerge. These novel education developments at distance are operated on global bases. Education institutions at distance learning will win, when having an audience in the entire world, but they will have to continue being linked with this audience of foreign countries, by means of consultants.

Of course, one in the best ways of learning at the present time, is doing it. A little less drastic are the outlines of active learning, where the executives either manage special projects inside their own areas or in any other part as a planned process of performance. These outlines that have been with us for several years, also have the advantage of the project s value and the test of managers audacity. These projects can involve individual action or to lead to a team project, usually of a multidisciplinary nature.

In the past, the time taken to obtain experience and maturity has made to management a field of older men whose energy and forces of creativity weakening are inevitably. One only has to look back, to see that the young men have been able to create when an opportunity has arrived to people of great talent. The executive professional youths, with an urban culture, trained in private universities, also well-known as the " yuppies ", they are those that more quickly are assimilating the technological advances and incorporating them to the directive and managerial practices of the organizations.

To be in agreement with the current changes, organizations not only should incorporate to technology but rather the individuals will have a change in mentality as a change in organizational relationships and it will be a change in the managerial style. The incorporation of technology to the directive and managerial practices and the use of the telematic, make possible that organizations structure their administrative outlines in agreement with the necessities and socioeconomic conditions of the country. With this practice, it should improve the competitive position to the international level. The above-mentioned has given as a result the linking of the administrating and managerial professionals with the productive and social sectors.

Conclusion

Concluding, the managers of the future will have to be agents of development of those organizations to which they are integrated. They will be creative and innovative leaders with clear concioussnes and awareness of their social responsibility, with a strong discipline of work, with a high level academic development, and that they know how to appreciate cultural and social values of diverse countries.

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Web Based Instruction: A Paradox And An Enigma Of Instructional Paradigms, Pedagogy And Design Principles

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Abstract

If we look at the delivery of information and learning via web-based instructional systems we find some similarities to traditional learning, however we find more differences than similarities. We find that many web-based instructional systems do indeed make use of stimulants such as movies, sounds, and graphics. We also find that the best web-based instructional sites provide a reference library of sorts, to assist the student in their understanding of the material elements of the particular course. These reference libraries are usually hyper links to other educational or related Web sites, which the student can use as a resource to further enhance their understanding of the materials. Some hyperlinks use video and animation to gain and hold the attention of the student, while others are merely page turner type of information sites.

But what of the interaction that takes place in the traditional classroom? What becomes of the theoretical arguments that an experienced educator would foster, stimulate, and encourage among the students and/or the educator? What becomes of the personality, fervor, and strength of conviction that normally results as a benefit of these stimuli? What becomes of the vocal intonations, inflections, and the facial expressions exhibited by the student? Are these qualities lost in web-based instruction? Can a chat session accomplish and achieve the finer points of theoretical argument without having the face-to-face stimulants and reactions that are readily apparent in a traditional classroom?

This paper will present the argument that on the basis of initial statistical information that in some cases web-based instruction is not succeeding, and in fact experiences substantially higher attrition rates than traditional class room instruction, with all other variables being equal.

Web Based Instruction: A Paradox And An Enigma Of Instructional Paradigms, Pedagogy And Design Principles

Thesis Objective

The hypothesis of this paper is to present to the reader an argument as to whether existing instructional paradigms and design principles, philosophies, pedagogy, and practices require revision to effectively teach web-based instruction. Due to the length restrictions of this paper the reader is advised that not all paradigm s, philosophies, and practices are included, and those that are evaluated as to their usefulness in web-based instruction are very limited in scope, definition, and explanation. In all probability you will find that this paper will ask more questions than it answers, but in doing so will hopefully stimulate each of us to critically view and analyze the effectiveness of the current and prevailing practices employed in web-based instruction. Additionally the reader will find reference to a recently completed three-year study comparing attrition rates of web-based instruction to traditional classroom instruction.

Background

As early as 1973 Daniel Bell, and later in 1980, the futurist Alvin Toffler identified several massive changes that our society has undergone: from the agrarian age to the industrial age, and now the information age. These futurists predicted a complete change in our societal values, and the reforms that would be necessary to accommodate the change from an industrialized to an information based society. In many cases, these futurists were correct in their predictions, and our society today is indeed mired in the process of adjusting itself to accommodate this new age of information and technology.

In looking at our educational systems and the population of students that these systems serve we find quite a vast array of scope and difference among students. Demands upon and within the educational sectors are changing. For higher education, demographics and workforce changes are fundamentally altering the student population. In 1995, 44 percent of all college students were over 25 years old, 54 percent were working, 56 percent were female, and 43 percent were attending college part time. In 1997, more than 76 million American adults — 40 percent of the adult population — participated in one or more adult education activities, up from 32 percent in 1991 (National Center for Education Statistics).

Today students lifestyle and objectives are also very different than those students of yesteryear. It is not at all uncommon to find that today a typical student may be a single parent, who may be working two or more jobs to make ends meet in order to provide for their family. This same person may want to pursue a higher education, but may be unable to do so as a result of time commitments and constraints that are usually and traditionally required in institutions of higher learning. Additionally we find that many students do not have specific available time blocks, which they can reserve or allocate to a particular course or educational unit of instruction on a regular basis.

More students than ever before engage in learning programs that offer courses at nights or weekends. Some educational institutions even offer courses on Sundays — which in some religions could be considered sacrilegious! Schools have realized that in order to sustain themselves and to remain competitive they must adjust their offerings to accommodate this diverse and ever growing population of students.

As a result of newfound technological advancements in the fields of computer technology, education, and instructional technology, we find that web-based instruction is becoming somewhat commonplace in what would be considered traditional higher educational settings. Many schools now conduct a minimum of some type of web-based instruction. Additionally an entire new industry of web-based instruction has risen to compete with the universities in this endeavor.

In those otherwise traditional institutions where the implementation of web-based instruction has been implemented, the school is assisting the non-traditional student in the meeting of their educational goals and objectives. The school is also meeting its own social obligation to educate even the most non-traditional of students. With the movement toward web-based instruction well underway, the question and thesis of this paper, is whether prevailing instructional and design practices are suitable to effectively support the non-traditional student in their use of web-based instruction.

Instructional Paradigms and Theory

A paradigm as defined in Snelbecker s *Learning Theory, Instructional Theory, and Psychoeducational Design,* is a basic pattern or plan in verbal or diagrammatic form which serves to describe recurring basic features of the phenomena being studied. Therefore in extrapolating and interpolating the term instructional paradigm we could state that the definition would be a set of forms or examples of educational theory and practice based upon particular elements. You could in a broader sense regard this as the practice or pedagogy of instruction and/or design.

Probably the most noteworthy expert on instructional design paradigms is Robert M. Gagne, who authored the *Principles of Instructional Design*. Gagne bases his paradigms on the belief that instructional design efforts must meet intellectually convincing standards of quality and that such standards need to be based on scientific research and theory in the field of human learning. Gagne takes into consideration learning outcomes, including intellectual skills, cognitive strategies, verbal information, attitudes, and motor skills. He also considers the knowledge, skills, and abilities of learners and how the differences among learners affect instructional planning and design.

Behaviorism was a term coined by the American psychologies John Broadus Watson (1878-1958) in his paper, *Psychology as the Behaviorist Sees It.* It is a theory of animal and human behavior holding that actions can be explained entirely as responses to stimuli, without accounting for the profound influences of interpretation on introspection. Thus an educator who believes in behaviorism would tend to attribute learning as a reaction to an event or action that would stimulate the student, but would be provided by the educator. To the behaviorist, teaching is essentially a matter of arranging contingencies of reinforcement so as to produce and maintain prescribed behaviors.

Constructivism is quite an opposite paradigm of behaviorism as described and defined above. Jerome Brunner first proposed the concept of constructivism in the mid-1960 s and builds on earlier ideas of Jean Piaget. Basically, the theory of constructivism holds that the learner rather than the educator develops or constructs knowledge and that opportunities created for such construction are more important than instruction than that which originates from the educator. This is certainly not to state that there is not educator guidance or involvement, but that the student essentially will have a very strong voice in the selection and completion of tasks that will aid her in their learning approach to the given subject matter.

Web-Based Instruction

If we look at the delivery of information and learning via web-based instructional systems we find some similarities to traditional learning, however we find more differences than similarities. We find that many web-based instructional systems do indeed make use of stimulants such as movies, sounds, and graphics. We also find that the best web-based instructional sites provide a reference library of sorts, to assist the student in their understanding of the material elements of the particular course. These reference libraries are usually hyper links to other educational or related Web sites, which the student can use as a resource to further enhance their understanding of the materials. Some hyperlinks use video and animation to gain and hold the attention of the student, while others are merely page turner type of information sites.

But what of the interaction that takes place in the traditional classroom? What becomes of the theoretical arguments that an experienced educator would foster, stimulate, and encourage among the students and/or the educator? What becomes of the personality, fervor, and strength of conviction that normally results as a benefit of these stimuli? What becomes of the vocal intonations, inflections, and the facial expressions exhibited by the student? Are these qualities lost in web-based instruction? Can a chat session accomplish and achieve the finer points of theoretical argument without having the face-to-face stimulants and reactions that are readily apparent in a traditional classroom?

The correct response to these questions is that it depends upon the design of the course and the process of delivery that is used. If a web-based course is designed along the lines of the Gagne theory of instructional design, it could certainly achieve and accomplish its objective. However while the elements of design are crucial and critical, so is the interaction of the students with both each other, as well as the educator. Regardless of how well web-based instruction is designed, if it is designed solely as a stand-alone product without any human interface or interaction it will, at the very least, not meet its learning objectives or in the worst case, the ultimate goal to educate. Most students need interaction and human intervention so as to gain and experience the sociological elements of instruction.

The focus of a recent study by West Texas A & M University on the attrition rates for 15 graduate business courses offered on campus as well via a web-based instructional method reveals some interesting statistical patterns. During a three-year period beginning in 1997, it was convincingly found that MBA courses delivered via web-based instruction experienced a substantially greater attrition rate than did the same courses taught by the same professors in a traditional setting. The only variables between the two settings were the students and the delivery medium. The overall combined attrition rate for the web-based courses was a resounding 50% greater than the on campus courses, with several web-based courses experiencing an attrition rate of greater than 100% of those taught using traditional methods on campus! Some of the explanations of the higher attrition rates offered by the authors of the study include but are not limited to the following factors:

- Students were not able to adjust to the self-paced approach.
- The rigor of the study was greater than anticipated.
- Lack of student and faculty experience with web-based instruction.

Of particular concern and note is that courses in the various business disciplines that rely upon mathematics appear to be especially ill suited to web-based instruction. As an example a Statistical Methods course on campus experienced a 13% attrition rate, while its web-based equivalent experienced an attrition rate of 43%, or greater than 3.3 times the attrition rate of the on campus course. A Quantitative Analysis in Business web-based course experienced an attrition rate of 33% as compared to the same on campus course which experienced an attrition rate of 17%, or about half that of the web-based course! These differences in attrition rates should not and cannot be ignored.

In a survey of online teachers and learners recently prepared for the Project Steering Committee of the VET (Vocational Education Teachers) Teachers and Online Learning Project the report author indicates that there are several themes running through the comments that are cautionary. These include the need to ensure that the instructional design is correct, and that motivation concerns, as well as the difficulty and confusion of on-line users is taken into consideration during the design process.

Could it be that our quest to satisfy the masses and provide an educational forum for such a diverse audience is somewhat poorly designed or ill conceived? Could it be that the lack of human intervention or contact is a contributor to the causes of frustration and ultimately to the significantly higher attrition rates of web-based instruction?

In my own teaching experience in web-based instruction, I have found that even on the best graphically designed Web site, the student needs and will actually seek out interaction with another student or the educator. This human intervention and interaction is crucially required of many students, but not all. Some students are perfectly content viewing and reading information from a computer monitor and learning in this way. But the two fundamental design questions remain: what is the objective of the particular course, and what is the desired instructional outcome? If these two questions do not include the learning of social interaction among culturally diverse students, have we not failed to meet our social obligation to educate?

To illustrate further I have discussed web-based instruction with Professor Margaret West, Ph.D. of Northern Illinois University. In any course in which Dr. West provides web-based instruction she insists on face-to-face class meetings at various points throughout the semester. This allows the students to interact not only with each other but also to be mindful of the humanness of the educator. It allows the educator also to view the humanness of the student, who may be shy, or intimidated by either the web-based instruction, or the human interaction with fellow students. In any event this human interaction provides a further development of the educational endeavor, and allows for the student to learn the intricacies of the social environment of learning.

In having the opportunity to bring to fruition a mix of the traditional class room environment along with a constructivist educational attitude, I believe that the student will learn a great deal more as a result of human intervention and interaction than when merely left alone at the Web site to learn. The fact of the matter is that much of web-based instruction includes the ability of the student to engage in forum discussions with other students, and at predetermined times with an educator leading the course of discussion. Additionally in many web-based instructional settings the student can and does frequently send emails to the educator or other students. Fundamentally however, these interactions are not human interactions at all. These keystrokes are merely a very weak substitute for the actual human interactions that would readily take place in a traditional classroom setting and provide only for the instantaneous delivery of inquiries and work product.

Certainly there are numerous other theories of instruction that could possibly demonstrate arguments on either side of this thesis. As an example, lets briefly consider problem-centered learning, within the element of web-based instruction. One of the most noteworthy educators of our times, Dr. Thomas M. Duffy of Indiana University and Unext.com (Cardean University) is a strong proponent of problem centered learning in a web-based environment. Under the direction of Dr. Duffy, Unext utilizes problem centered learning on most of their web-based MBA offerings.

While I certainly possess neither the education, the credentials, nor the experience to argue this point with Dr. Duffy, I believe that I can respectfully suggest at a minimum that problem centered learning on the web, may not be suitable to every student. Once again, without human intervention and the social implications and benefits that this type of interaction provides to the student, the student may eventually find themselves lost in their ability to intellectually and emotionally engage in the most simple of arguments or discussions.

Aside from the normal fears that some students have relative to their ability to function within a personal computer environment, what other fears may exist if we enroll this student in a web-based course to which she may possess little or no knowledge, and then throw her to the wolves using a problem centered scenario? I fully realize that even in a problem centered scenario there are on-line resources available to the student including chat forums, additional reference materials, and even periodic and timely assistance and feedback by the educator. However, without having any academic knowledge of the subject matter, coupled with these other fears within a problem centered scenario, with little or no in-person intervention available would appear to be a situation that would have a high likelihood of failing to meet the learning objectives of that particular course of study. Even if specific learning objectives were met and determined to be successful, have we not failed to provide the student the type of human interaction and socialization that may assist them overall in their particular vocation? Why would we want to place a student in the position of potentially passing a course of web-based instruction, but not learn the art and beauty of social interaction and behavior coupled with intellectual stimulation and constructive argument?

On the positive side most web-based instruction does provide discussion forums, discussion groups, and email capability. Collectively these various venues enhance the students ability to write philosophically and intellectually. Using these forums will indeed enhance the educational benefit of web-based instruction, but not necessarily to the same extent that web-based instruction coupled with human interaction could or does.

Conclusion

The solution to the issue of designing an effective web-based instructional model lies in the answer to the following question. In which ways can web-based instruction bring both the best instructional process to the student, as well as bring about the convergence of a stimulating and encouraging environment of learning while also meeting learning objectives within a social environment? Is a shift in design and practice paradigms necessary, or are what we are experiencing merely a juxtaposition and congruency of the instructional design principles of Gagne, coupled with the principles and practices of either the behaviorist and constructivism approaches to learning?

Is or will it ever be possible for us as a society to provide the same type of interaction that takes place in classrooms via web-based instruction? If so, will we loose any of our abilities as educators, or will web-based instruction create more clearly defined challenges and obstacles to the educational process? Will web-based instruction be able to take advantage of alleviating distances between the masses while still being in a position to provide a quality education, or will web-based instruction fall by the way side as merely a technology fad that was temporary at best?

With only limited research or empirical data and/or analysis available on this topic or of the effectiveness of web-based instruction to accomplish learning objectives, we can all pontificate and engage in this type of hyperbole. However with the emergence of preliminary research as referenced earlier, there are strong indications that web-based instruction may not be achieving its educational goals. What may be necessary is that a combination of the tried, tested, and scientific principles of instructional design and educational pedagogy must be employed in order for web-based instruction to succeed. Unequivocally, under no circumstances should proven instructional principles be sacrificed in order to serve the masses more efficiently.

In order for web-based instruction to succeed with the same or exceedingly difficult goal of increasing the benefit of the educational experience to the student, a new type of web-based design and instructional practices, principles, and pedagogy will emerge. A new type of instructional delivery system will continue to emerge and evolve as a result of technology advances and convergence in the way of high-speed video conferencing, tele-immersion, and real time conversations using a readily available and affordable high capacity bandwidth.

A new type of educator will also emerge. This will be an educator who has had the successful experience of teaching in a traditional classroom setting but is able to take advantage of the technology to bring forth a better delivery method of instruction within a web-based instructional setting. This will be an educator who believes that personal intervention within a web-based environment is not only necessary for the student, but also for the educator and indeed will provide a valued sociological benefit to both.

Is web-based instruction a suitable alternative for all subjects, for all students, and/or for all institutions? The unequivocal response to this rhetorical question is of course not. Each of us possesses certain behaviors, skills and attributes, which allows us to learn. We are as different in these processes as the night is from the day. Web-based instructional methods are only a single source utilized to expedite instruction. Some students will continue to use the services of a traditional institution, coupled with web-based instruction, while other students will be more suited to the rigors of a traditional classroom situation.

Will we require making a committed and concerted effort in a paradigm shift in order for web-based instruction to succeed? I am not certain that a complete shift in tried, and tested philosophies, paradigms, and methods is as necessary as is the return to the fundamental approach to education which is to recognize the uniqueness and differences in learning style s and learning patterns that distinguishes us as human beings, students, and individuals. Only with the acceptance of these learning differences can we as instructional designers, and educators utilize the technology resources to reach the masses. Only with this recognition of differences will we be in a position to challenge and to establish new paradigms of instructional design philosophy. Only with the recognition of these differences will we establish and possibly redefine the instructional philosophies and practices, which currently exist within a web-based learning environment.

Time, experience, technology and the dedication of educators and students to attempt new methods of delivery and instruction will be one of the bases of foundations for any new or re-configured paradigms and/or instructional practices that may come into existence in the future. The evaluation of these success and/or failed attempts coupled with only the passage of time will eventually allow us to effectively evaluate the changes necessary to determine if a shift in educational paradigms, philosophies, dogma and practices are required to suit the information age, and more specifically web-based instruction.

It is imperative and essential that the reader understand that I am not as a professional, just another contrarian opposed to web-based instruction. If web-based instruction is to be utilized as yet another delivery mechanism for instruction, it must be designed in accordance with instructional technology principles that take the humanness of both the student and the educator into full consideration. Ultimately if the human factor is incorporated into web-based instruction we as a society will have successfully merged technology with the human elements of communication to ideally suit a generation of students raised upon tried and proven principles of education, coupled with the use and the excitement of technological resources. The challenge ahead therefore, is to develop innovative web-based educational models that combine the best of both the academic and the corporate worlds.

In any event, we as educators are very fortunate indeed to be involved on the cutting edge of a distance learning evolution and revolution! What an exciting opportunity for each of us to participate in the development and establishment of a new paradigm ideally suited to this new and ever changing technology as well as meeting the needs of the student and society. What an exciting time to be involved in the educational process and in the future development of intellectual stimulation, inquiry, and argument using advanced technology!

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Integration of WebCT into the Distance Education Administrative Model at the University of Manitoba (One year later)

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Abstract

In the summer of 2000, Distance Education at the University of Manitoba moved all online course offerings to WebCT from the ASTER system. In addition to online offerings, all print-based (independent study) course offerings were given limited online components. The paper outlines the criterion used in the decision making process and how those criterion were met using WebCT 3.0.

More timely feedback was the main motivation in providing online components to print-based students. In order to gage the success of this project, access rates for print-based students were examined for 6.0 and 3.0 credit hour courses in the 2000-01 regular session, academic year. 38% of 6.0 credit hour and 33% of 3.0 credit hour independent study students accessed their WebCT course at least once. The access rates where also examined by faculty with some faculty differences noted.

Net-based study students were surveyed to gage acceptance of the technology. 8% of the student respondents had negative reactions to the technology, while 32% had positive reactions to the technology. The remaining students made either neutral comments or made comments that were not applicable to WebCT specifically.

Student services administrative issues are the largest barrier to WebCT that was discovered over the course of the academic year. The administrative model for the Distance Education unit includes assignment tracking. Staff members found the access times for the WebCT gradebook to be unacceptably long. Instructors found the assignment grading process to be cumbersome and time consuming. Plans for addressing these issues are underway.

Keywords

Online courses, distance education, Net-based study, WebCT, technology based education.

Integration of WebCT into the Distance Education Administrative Model at the University of Manitoba (One year later)

Introduction

The University of Manitoba was founded in 1877 and is the largest post-secondary institution in the province of Manitoba. Each year the University of Manitoba undertakes to educate more than 22,000 students in degree programs and approximately 5000 more in continuing education, non-degree programs. With more than 4000 teaching and support staff, it is also one of the largest employers in Manitoba.

Distance Education (DE) at the University of Manitoba is an academic unit that concerns itself entirely with degree credit courses. DE courses are, therefore, governed by the academic regulations governing on-campus courses. The DE unit, however, resides for historical reasons only under the administration the Continuing Education Division.

The decision to offer online courses was made prior to the University of Manitoba selecting WebCT as a courseware package. An evaluation of existing systems determined that systems available at that time did not meet DE's objectives. By the time that WebCT had been evaluated by the Academic Computing and Networking unit and had been chosen as the University of Manitoba Web course platform [HREF3], the DE unit had received funding to develop an assignment submission system. As a result, a programmer was hired and DE undertook to develop the "Assignment Submission Transfer Evaluation Return" (ASTER) System. The ASTER system was used by DE until the fall of 2000 to offer online courses.

The Business Model for Distance Education

The original decision to develop the ASTER system was based on a number of factors, some of which arose out of the business and administrative model for DE. In order to understand the functioning of DE at the University of Manitoba, it is necessary to first understand the process by which DE develops a new course offering.

Course Development Process

The decision to develop a new course offering is made by DE in conjunction with the department that has academic responsibility for that course. DE instructional designers work as part of a team with a content specialist who is recommended by the academic department. The course material is developed and submitted to the department head for approval. If the course material is confirmed as equivalent to the on-campus version, approval is granted. DE does not change the substance of the course without a departmental review. Therefore, if major revisions are required to a course (usually on about a 5 year cycle), the course must be re-approved by the appropriate department.

It is necessary for a number of reasons, including budgetary constraints, that DE control changes to course content. Unlike the on-campus model, where instructors have considerable freedom to teach and evaluate their courses, within the guidelines of the syllabus, the staff hired to teach distance courses must teach the content as provided in the course materials. They also must use the term work and grading scheme specified in the course materials.

Assignment Tracking

Currently, assignments are tracked by DE Student Services staff members. With the exception of Net-based courses, students submit assignments to Student Services, rather than directly to the instructor. Received dates are recorded and assignments are passed on to the instructor. Graded assignments are also returned to Student Services by the instructor. The grade and the returned dates are recorded, and the assignments are mailed back to the student. (In Net-based courses, the tracking task is carried out automatically via the courseware package.)

The assignment tracking process serves two major purposes for DE. The first is quality control. Since the success rate of the self-study student is affected by timely feedback (Garrison, 1989), it is important that DE be able to monitor the turn-around time for assignment grading. The turn-around time is then used as one of the decision-making factors affecting at the reappointment of instructors. The second purpose served by assignment tracking involves the payment of the instructors. Since DE course materials contain the course content as well as practice and self-assessment activities, instructor responsibilities involve tutoring and grading. Instructors are, therefore, paid a tutorial stipend (on a per student basis). More specifically, DE instructors are paid for students who submit at least one assignment per term. Under this administrative model the tracking of student assignments is a very important function for DE.

The ASTER System

When the ASTER system was developed in the mid-1990s, it was developed using the DE business and administrative model. The system was built with a student view for assignment submission, an instructor view for grading and marking, and a student services view for assignment tracking. Administrative tasks were completed by a knowledgeable programmer, using the University of Manitoba s Web server.

The ASTER system was designed using a mSQL database (Hughes Technologies, Queensland, Australia), Perl scripts and a Web Interface. The system required assignments to be submitted in HTML format. The students assignments were stored on the Web server. The instructor would open the assignment as a Web page, save the page, make comments and grade the assignments, and then upload the modified assignment back to the Web server. The students original assignments would never be modified, and the instructor could easily place comments in the appropriate location in them. Returning the commented assignment to the student was an easy process for the instructor.

There were a number of administrative difficulties associated with the ASTER system: The ASTER system was originally conceived as a pilot project, the intention of which was to develop a single course and evaluate it. The single course began to slowly expand to more courses and the underlying infrastructure of the system was never modified. As a result, it became very difficult to administer and that difficulty increased with every course addition.

The Online Plan for Distance Education

Despite the hype over online education, DE continues to experience growth in independent study (IS) courses. Wallace (1996) notes that enrollments in IS courses increased at the University of Manitoba by over 400% between 1984 and 1995. In comparison, on-campus enrollments increased by just 4% over the same period. In the 2000-01 academic year, IS enrollments increased by over 15%, while on-campus enrollments increased by 11% over the previous academic year. Over the same period, Net-based (NB) course enrollments increased by over 250%. While this increase seems astronomical, it is not as impressive when the low total NB enrollments are considered. In addition, in the 2000-01 academic year, two new NB courses were introduced. Both were very popular in comparison to other NB courses at the University of Manitoba. If those two courses are removed from the calculations, the increase in NB enrollments is only 35%. Even considering the 250% increase in NB enrollments, the total NB enrollment (92 registrations) was still only 2.3% of the total IS enrollments (3,387 registrations) in the 2000-01 regular session academic year. Clearly, plans for an online system needed to include independent study courses.

The plan for DE was to provide online tracking of assignments for all DE courses. This plan ensured an added benefit to IS students, but did not alter the current operating model. Since the IS assignments are mailed back to students, the delay in receipt of feedback sometimes required students to submit a current assignment before receiving any feedback on a previous one. These delays also resulted in many calls to student services staff.

DE had also struggled for years to build networking for its students. Several methods had been tried unsuccessfully and a system that would enable students to develop online learning groups seemed desirable.

While it was quite clear that a Web-based system was the direction in which DE needed to move, there were a number of important criteria to be addressed. Any system that did not meet all of these criteria would not be acceptable. The main criteria for a system were the following:

1. An automated method for placing students in their online courses.

2. A single login for all DE courses.

3. An assignment tracking system that would allow students to access their grades through the Web.

4. An affordable system, as DE is a cost recovery unit.

5. The courses to be hosted on a University of Manitoba server.

6. The need for DE to control course content changes in online courses.

The Move to WebCT

The plan for DE online could no longer be met by the ASTER system because it needed to be rewritten. DE was in the process of examining commercial courseware systems as an alternative to rewriting ASTER when WebCT 3.0 was released. The inclusion of a global database with a single login for all courses provided the framework from which we could work with WebCT. The global database also allowed us the possibility of creating student accounts from our existing student records system. With an automated process of creating and maintaining student accounts, came a single login page and the added benefit of students seeing all their WebCT course listings, not only their DE courses. This concurrent listing of DE courses and on-campus courses supplemented by WebCT was considered to be of considerable benefit as our student demographics indicate a trend to students enrolling concurrently in DE and on-campus courses. For example, between 1984 and 1994, the percentage of concurrent students rose from 29.2% to 65.9% (Wallace, 1996).

The decision to move to WebCT was made in June of 2000, after the University of Manitoba participated in the beta testing of WebCT 3.0. By September, 2000 every course offered by DE, with the exception of some Campus Manitoba courses, had WebCT components. The components placed in WebCT are summarized in Table 1.

Delivery Method	Description	Web Components placed in WebCT
Independent Study	Course is delivered in a print-based format. Some courses include video- or audio tapes. Assignments are submitted by mail, fax, or in person. Student-instructor interaction by telephone or email.	*Assignment tracking. *Course email, chat, and discussion groups were also enabled, but considered optional.
Independent Study (optional online assignment submission using ASTER)	Independent study course with an optional online assignment submission method.	*Assignment submission. *Assignment tracking. *Course email, chat, and discussion groups were also enabled, but considered optional.
Campus Manitoba	Multi-mode delivery. Students use independent study materials, supplemented by weekly audio-graphic tutorials delivered over the Internet using Learnlinc. Students have a class environment because they attend a regional learning centre for the tutorials.	*Campus Manitoba courses delivered in a Net-based format were moved to WebCT. *All other Campus Manitoba courses are delivered without the use of WebCT.
Group-based Study	Independent study, supplemented by regular audio conferences.	*Assignment tracking. *Course email, chat, and discussion groups were also enabled, but are considered optional.
Net-based Study	Course is delivered entirely online, including course materials and assignment submission.	Entire course in WebCT.

Table 1: Distance Education Delivery Methods and Components placed in WebCT

How the Criteria were met

Criterion 1: An automated method for placing students into their online courses.

This first criterion needed to be met before DE could consider moving to WebCT. The plan included all DE students (~5000 registrations per year), therefore this was the most critical step. Since all degree credit students are registered in the same system, any software built to accommodate DE would also be beneficial to on-campus instructors who were using WebCT to supplement their courses. A Perl Script called AUTOREG was written by the Academic Computing and Networking staff to integrate student course enrolment information from the student records system to the WebCT global database.

AUTOREG runs once a day and synchronizes student records course enrollment information with WebCT courses. This includes creating new accounts for students who do not currently have a WebCT ID and updating enrollment information for those students that have a WebCT ID. As students add, withdraw or drop courses, their corresponding WebCT ID is updated. AUTOREG reads a SYBASE table that contains the WebCT course IDs and the corresponding Student Record course IDs. AUTOREG uses the information in this table to push the students into their appropriate WebCT course sections. When a course is added to or removed from WebCT, the SYBASE table is modified by the appropriate administrator from DE or Instructional Technology. Details of the procedure are available at: http://www.umanitoba.ca/campus/ist/cms/webct/designers/autoreg.shtml

Criterion 2: A single login for all DE courses.

WebCT 3.0 included the myWebCT feature. MyWebCT allowed for single login access to any course that is included under a particular UserID. When a student logs in, all current WebCT courses are displayed on the student s myWebCT homepage. Any student registered in a course with a WebCT component is given a WebCT UserID by AUTOREG. If that student changes his or her registration, the WebCT UserID is not dropped from the database. The courses attached to it, however, may be modified. These modifications are reflected on the student s myWebCT homepage, but the student s login procedure is never altered. Because AUTOREG is used for both on-campus and DE courses, students who are registered concurrently will see all WebCT courses listed on their homepage.

Criterion 3: An assignment tracking system that would allow students to access their grades via the Web.

Since WebCT appears to be designed to meet the needs of an individual instructor preparing an online course offering, it did not provide a global assignment tracking method. It did, however, offer online assignment tracking for individual courses. Therefore, a WebCT course was created for each course section offered by DE. Within each course, 3 editable columns were added to the gradebook for each assignment in the course (i.e., one column for the date received, date returned, and grade. Within each course, a Student Services staff member was set-up as a TA. This staff member would enter the appropriate course gradebook and modify the dates and grades as required. Students could then log on and check these dates and/or grades within seconds of the data being entered by our staff members.

Criterion 4: An affordable system, as DE is a cost recovery unit.

Since DE was able to use WebCT without the existing University of Manitoba license requiring modification (see criterion 5), there were no license costs for DE to absorb.

The expense incurred by DE was payment of 50% of the overtime salary to the original programmer in order that the AUTOREG program could be completed on schedule. The Information Services and Technology unit absorbed the programmer s regular salary and the Instructional Technology unit paid the other 50% of the overtime salary.

The second cost incurred was the cost of mailing UserID and Password letters to students. This letter was originally intended to go out with the IS course packages. However, due to security issues, AUTOREG was not synchronized with the program that produces mailing labels for students. As a result, student services staff spent an unacceptable amount of time trying to match student letters to course package labels. Eventually, the decision was made to mail the course package separately from the student letters, thereby incurring extra postage expenses.

About half-way through second term registration, this letter was modified to be a generic letter that outlined how student UserIDs and passwords were constructed. Since the letters were no longer personalized, it was no longer necessary to match a specific letter with a specific student. The generic letter was once again included with the course package, and no further additional postage expenses were incurred.

The final cost, that of staff time to input assignment tracking, is difficult to quantify. As WebCT was not designed to support the type of assignment tracking that DE performs, our staff member had to enter and exit many course gradebooks each day. This was a very time consuming process because WebCT builds gradebook pages very slowly. As a result, during peak assignment times, extra staff were needed to enter assignment information. In addition, the one staff member who normally performed this task full-time found that it was necessary to occasionally work overtime.

Criterion 5: The courses had to be hosted on a University of Manitoba server.

The University of Manitoba has been hosting WebCT on their Web server since 1997. DE was able to use WebCT without the existing license being modified.

Criterion 6: The need for DE to control changes to the course content.

For the reasons outlined earlier, it was important to prevent Web savvy instructors from modifying online course content. DE instructors were, therefore, given TA access. The TA access level does not allow the user to modify the course materials; the user is still able, however, to grade assignments.

Results of the first year

Net Based courses

The substance of the Net-based offerings did not change in WebCT. Enrollments in courses previously offered did not increase substantially in total numbers. The exception to this was a single graduate level course that increased from 0 students enrolled in the 99-00 academic year to 7 enrolled in the 00-01 academic year. Overall enrollment increased 35% for previously offered courses, and 268% for all Net-based courses, including new course offering (based on enrollment data collected on September 15, 2000).

Since the substance of the Net-based offerings did not change, the greatest benefit of using WebCT accrued for the DE administration, rather than for students. The development of AUTOREG has meant that the administration of Net-based courses has been greatly simplified. It is now possible for DE to greatly expand our Net-based offerings without adding additional staff resources.

An attempt was made to evaluate the acceptance of WebCT by Net-based students. They were asked to provide comments on the following: technology used for accessing the system, instructor contact, student interaction, method of delivery, assignment submission and return, library access, and suggestions for improvement. The student responses were rated based upon the following criteria.

Positive — a response was considered to be positive if comments containing the terms technology , net , web , Internet , online or WebCT were entirely positive.

Negative - a response was considered to be negative if comments containing the terms technology , net , web , Internet , online or WebCT were entirely negative.

Neutral - a response was considered to be neutral if comments containing the terms technology , net , web , Internet , online or WebCT contained both positive and negative aspects.

Not Applicable — a response was considered not applicable if comments did not contain the terms technology , net , web , Internet , online or WebCT

The three most heavily enrolled Net-based courses (70 registrations) were used in the analysis. The overall response rate to these questions was 61%. The results of this analysis are summarized in Table 2.

Positive	**Negative**	**Neutral**	**Not Applicable**
32%	8%	16%	44%

Table 2: Student acceptance of WebCT

Independent Study courses

The perceived benefit to independent study students is more timely feedback on assignments. At the very least, students gain access to assignment grades. As noted earlier, students previously called the DE student services office, and a staff member would have to take the time to look up the student s assignment grade.

In order to evaluate whether Independent Study students actually used WebCT to check their grades, the access rates for these courses were examined via WebCT s internal student tracking. The tracking information includes the number of times a student has accessed a course. Six credit-hour courses running from September to April, and 3 credit-hour courses running from January to April were examined.

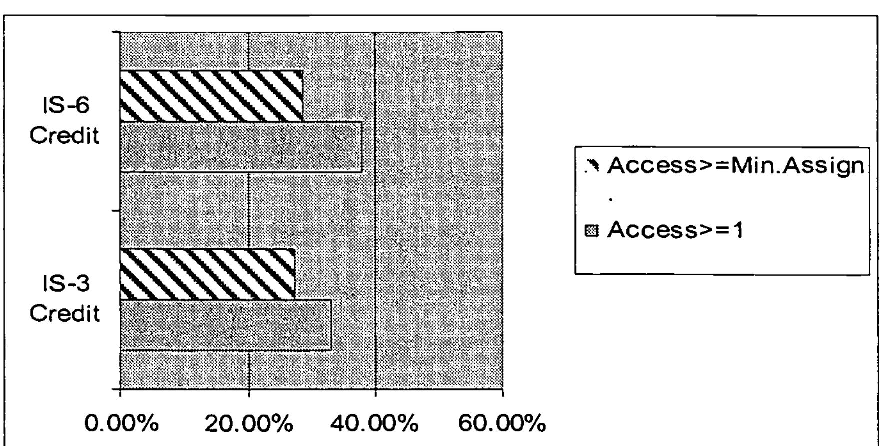

Figure 1: Access rates for independent study courses

Access rates were measured in two ways. The first count included all students in the WebCT course who had accessed the course at least once. The second count included all students who had accessed the course at least a number of times equal to the number of assignments. In the 6 credit-hour courses, the minimum number of assignments was 5, in the 3 credit-hour courses, the minimum number of assignments was 3. The access rates were calculated using the course enrollments that existed in WebCT. These course enrollments include students who subsequently delete, voluntarily withdraw, or are dropped from the course for lack of payment. Since there is not an easy way of comparing the final student records enrollments to the WebCT student tracking information, only the WebCT numbers were used. It is probable that access rates would be higher if only the students who completed the courses were examined. The access rates are summarized in the histogram presented in Figure 1.

Access rates by faculty in which student were enrolled were also examined. Table 3 summarizes the access rates for Independent Study courses by faculty.

Faculty	**Access>=1**	**Access>=Min. Assign.**
Arts	38.1%	29.6%
Education	35.7%	29.8%
Nursing	26.4%	21.4%
Science	29.9%	22.9%
Social Work	31.0%	26.3%

Table 3: Access rates for independent study courses by faculty.

Conclusions and Future Directions

After one year of use in DE, some impressions can be shared regarding the success of WebCT in meeting the needs of our students and staff. WebCT appears enjoy a high level acceptance among Net-based students, with only 8% of student respondents making negative comments about the technology. Over 30% of Independent Study students used the technology at least once during the course. Considering that WebCT access is entirely optional for these students, this rate suggests that WebCT serves a useful purpose for these students.

Negative comments made by Net-based students about the technology most often referred to the assignment submission process. There is also anecdotal evidence that instructors also found this process cumbersome. Instructors who had taught previously using the ASTER system were most likely to complain about the WebCT system for assignment grading, particularly with respect to length of the time required to access an assignment. The second most common complaint regarded the difficulty in returning assignment comments to students. The ASTER system stored both the original assignment and the graded assignment on the system. Instructors would place comments directly in the assignment file and upload the file. In WebCT, instructors were required to email the graded file back to the students using the WebCT email system. Many instructors who attempted this found the process unsatisfactory.

The largest obstacle to the widespread adoption of WebCT is the assignment tracking function. The unacceptable length of time required to enter student grades was also the cause of a great deal of frustration for student services staff members. In addition, the extra expense of hiring casual staff for assignment tracking overload became a budget concern in DE.

Several new directions are suggested by the concerns raised in the past year. In order to alleviate the frustration experienced by student services staff, a program is currently being written to provide a student services user interface for inputting assignment information. This program uses the WebCT API to modify the course databases, and will allow staff members to avoid directly interfacing with the WebCT gradebook.

In order to address the assignment submission frustration experienced by students and instructors, DE intends to allow students to submit assignments via external email. As a result, instructors will be able to grade the assignment file and return it to students directly. In addition, this assignment submission option will also be extended to students in many independent study courses.

Finally, a DE Student Network course will be set up for the 01-02 academic year. All DE students will automatically be entered in this course via AUTOREG. The plan is to provide increased networking and support opportunities for students taking DE courses.

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Acknowledgments

The authors would like to acknowledge the following people for their contributions to this project over the past year: Colin Angel, formerly of UMInfo; William Moore, UMInfo; Darleen Courrier, DE Student Services; and Donna Love, DE Student Services.

A special thank you to Bonnie Luterbach, Distance Education, and Lori Wallace, Distance Education, for very carefully reading this paper and making many valuable suggestions.

Integrating web-based curriculum as an on-line resource for an undergraduate introductory statistics course -- TAKE 2!

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Abstract

In the 1999-2000 academic calendar year, we presented an Introduction to Statistics course - nearly completely online . The completely portion referred to the fact that all of the lectures, assignments, and exams, were presented online . The nearly part referred to the presentation of weekly tutorials for individuals that were struggling with the online material, and especially individuals that had difficulty completing assignments. The consequences of our first attempt at online delivery were a higher than usual class average, a cohort of students that experienced web-based delivery - whether they wanted to or not, and a great deal of learning by the two course developers.

Introductory Statistics is difficult enough. Expecting students to understand concepts without experiencing the benefits derived from fellow students asking questions or discussing logic, as would occur in the traditional classroom, may be expecting too much. Following many discussions with colleagues and students, we revisited the presentation strategy. Our second attempt at online delivery recognized the utility of web-enhancement while being careful to avoid making the media the message . Through the selected approach, the course explicitly reduced the role of the electronic curriculum in the delivery, while enhancing the importance of traditional lecturing. The compromise was to leave the course notes (including many scenarios and examples) online, but continue to present the course through weekly formal lectures. The result was a learning environment in which students were required to go online to complete assignments, review course notes, or communicate with instructors and teaching assistants. The lecture hall became an environment of thematic conversational discourse rather than strict didactic presentation.

This paper describes the dynamics associated with including a web-based approach to the delivery of introductory undergraduate statistics. Specifically, the paper illustrates the results of applying lessons learned from our previous experiences.

Keywords

Teaching statistics, web-based delivery, online resources

Integrating web-based curriculum as an on-line resource for an undergraduate introductory statistics course -- TAKE 2!

Introduction

In the 1999-2000 academic calendar year, we presented an Introduction to Statistics course - nearly completely online . The completely portion referred to the fact that all of the lectures, assignments, and exams, were presented online . The nearly part referred to the presentation of weekly tutorials for individuals that were struggling with the online material, and especially individuals that had difficulty completing assignments. The consequences of the first attempt at online delivery were a higher than usual class average, a cohort of students that experienced web-based delivery - whether they wanted to or not, and a great deal of learning by the two course developers. Following the completion of the initial online delivery approach, the instructors spent the next few months cogitating the delivery format, both from an introspection of appropriate delivery methods to an evaluation of the student s capabilities to learn in the electronic environment.

The second attempt at online delivery recognized the utility of web-enhancement while being careful to avoid making the media the message . Specifically, the next approach to online delivery intended to apply lessons learned from the initial experiences.

For example, the instructors began the redevelopment process by asking colleagues and students about online delivery, especially identifying the perceived positive as well as the perceived negative attributes of online course delivery. The post course analysis produced resolutions which were accepted as guiding principles in the redesign of the delivery format for the presentation of the course in the 2000°-°2001 academic year.

Teaching undergraduate statistics

Expecting students to understand elementary statistical concepts without experiencing the benefits derived from fellow students asking questions or discussing logic, as would occur in the traditional classroom, may be expecting too much. Introductory statistics can be difficult, as Smith (1998 [HREF 5]) noted, students perceive statistics to be the "worst course they will take" as an undergraduate. Recognizing this tenet was important to the curriculum redesign process, especially when one considers that handling quantitative information and using statistical applications are ubiquitous in modern society. The ability to process quantitative information quickly, accurately and effectively is rapidly becoming an expected skill of the university graduate (Schaeffer (2001[HREF6]). According to Schaeffer (2001[HREF6]) "educated persons must have some understanding of data and chance . . . in order to function intelligently in (modern) Society". The challenge for instructors is to create a presentation of statistics curriculum that fosters an appreciation for the applications of quantitative methods while developing a comprehensive understanding of statistical theory. An effective and efficient presentation of statistics education curriculum will emerge when the lecture hall can become an environment of thematic conversational discourse rather than strict didactic presentations.

Cobb (1991) postulated that instructors could create such an environment if they incorporated the following elements into the delivery of statistical curriculum. First, instructors could demonstrate the importance of evidence-based decision making. Many societal judgements, such as those of government, industry, education, and law (to draw but a few examples), require supporting evidence from quantitative processing prior to the determination of outcomes. The concept of evidence-based decision making may be understood more effectively if it is reinforced with real data from "real-world" scenarios. Cobb suggested that students would be more successful in understanding statistics if instructors sacrificed theory presentation for additional examples and "real applications". Instructors could draw examples from the local media, university issues, or questions posed by students.

Next, Cobb discussed the concept of variability, stating that variability pervades statistical decision making and therefore students should experience this concept as it applies to their questions or their data sets. The notion is supported by the suggestion that students could be presented scenarios and opportunities to quantify variance and explain variability within their data sets.

Finally, Cobb proposed that instructors should provide feedback to the students for their handling of data inquiry and quantitative applications in order to create an experiential learning scenario. Cobb suggested that "learning is constructive" - the approach considers that instructors should spend less time lecturing and more time building, working with the students to understand the principles and the products of the computational processes.

Course Design

This half-credit course presented during the normal 12-week term, was designed to promote self-directed learning (Barab, Thomas and Merrill, 2001) in a cohort of year three students by combining weekly lectures with online assignments and learning resources. The primary objective was to introduce statistics to undergraduate students enrolled in the Kinesiology program. The course assignments were designed to support the concepts presented in the lectures and all materials were based on theories of quantitative methods. The course consisted of lectures based on theoretical and applied content, and regularly scheduled assignments. Lectures were presented according to the outline of material presented in the online link page shown in Figure 1. Additional information and background reading was available in the textbooks listed in the reference section included as a separate Web page.

Course Features

The instructor presented weekly lectures in which the concepts of statistics were introduced using a guided lecture style (Bonwell, 1992). At the start of each weekly lecture, the instructor introduced the statistical concept in general terms, the objectives for the lecture, and a thematic question. Students were asked to put their pens down and join the conversation voluntarily or through direct random queries. No student was invisible to the instructor, and therefore all students were considered at "risk" to become a participant in the dynamics of the lecture. The instructor stressed the principles suggested by Paul (1992) in which students were encouraged to draw from previously learned knowledge and experiences, question the meaning of computational outcomes, present alternative points of view, and analyse concepts. The lectures were intended to be rich in opportunities for information exchange without the struggle to record essential notes.

In an attempt to reduce the anxiety of inefficient note-taking, the instructors supplemented the weekly presentations by placing a series of "traditional lecture notes and resources" on the web.

The lecture notes and resources were presented through the popular unix-based WebCT course presentation software. The WebCT platform enabled the course developers to present the text of the lecture notes as well as the instructions for assignments using standard HTML. In addition, the instructors added web-based calculators called webulators'" to each statistical presentation. The webulators were developed using javaScript commands embedded into the original HTML code.

Using the WebCT platform, the course developers included communication tools through corresponding icons. Students had access to the bulletin board, a calendar with highlighted dates, and their personal grade file through the personalized student record keeping system of WebCT.

Throughout the lectures the instructor referred to the specific location of the online background material, and explained how the specific webulators could be used under a given scenario. For example, in the lecture on determining sample size, the instructor introduced a variety of sampling scenarios and linked each scenario to the specific webulator that could be used to resolve sample size computations. The functions of the webulator were then explained, highlighting the specific statistical concepts that were fundamental to the computational function.

Working asynchronously students were expected to complete four assignments over the term. Questions that arose during the student s online sessions were passed to teaching assistants electronically or raised in the weekly lecture presentations. The question-feedback loop was a dynamic component of the course presentation and took full advantage of the different modes of communication, including email to the instructor or the teaching assistants, bulletin board postings, online help pages, and lecture discussions.

Application of Teaching Strategies

The redesign of the online delivery attempted to draw from many strategies of teaching and learning. For example, the instructors sought to incorporate the principles of constructivism as a basic pedagogical construct. According to Whittle, Morgan and Maltby [(2000) HREF4], and Brooks and Brooks (1993) a constructivist pedagogy presents content in such a way as to explicitly engage the learner meaningfully. Second, a constructivist pedagogy creates an environment in which collaborative learning is encouraged so that input from all students (learners) is included in the learning process. Finally, a constructivist pedagogy encourages the inclusion of opportunities for problem solving.

Unlike the initial delivery of the online approach in which the entire course was offered online with weekly live tutorial sessions added as an adjunct, the redesign of the online delivery "featured" weekly, formal lectures. In the redesigned course, however, all lecture notes, assignment data sets, and webulators were presented online. In addition, the instructors created an assignment workbook to assist the students in locating essential learning concepts throughout the course.

A comparison of features in the 1999-2000 course offering and the 2000-2001 course offering are presented in Table 1 (below). The most notable difference being the "personal interaction" that existed in the second offering of the course.

Course Feature	1999-2000	2000-2001
Lecture notes available online	√	√
Weekly lectures (instructor present)		√
Weekly seminars/tutorials (instructor present)	√	
Weekly seminars/tutorials (teaching assistant present)		√
Assignment questions available online	√	
Assignment questions available in hard copy		√
Organizational plan explicit and reinforced		√
Student access to bulletin board and email at their own time	√	√
Accessible online calculators for computations	√	√
Assignment submission via hard copy (required)		√
Assignment submission via electronic format (required)	√	
Direct feedback to students on assignments and exams		√
Student access to the grades database on their own time	√	√

Table 1. Comparison of features in the offering of Introduction to Statistics: 1999-2000 versus 2000-2001

Introducing a student workbook

The suggestions of Cobb were considered throughout the redesign of the online delivery. Specifically, the development of an environment in which students could experience statistical examples and develop statistics thinking (Cobb, 1991). The instructors acknowledged the importance of creating assignment questions and lecture topics using "real world" scenarios. Consistent with the suggestions of Cobb (1991) and in keeping with the principles of constructivist pedagogy, the instructors developed a "hardcopy" workbook.

The workbook was an 84 page document that included, essential formulas, definitions of terms, scenarios, and assignments. The workbook was referred to as the "Online Companion", and was available for students to purchase at the University Bookstore. Most important, the "Online Companion" not only held the assignments (including a standardized answer sheet cover page), but the document was promoted as a resource that students could use to direct them through the online delivery and explain concepts that were presented in the weekly lectures. By utilizing the "Online Companion", the instructor was able to spend more time on concepts during the lecture presentation and less class time describing the recipe approach to computing statistics.

A comparison of bulletin board usage

In the initial delivery of the course online (1999-2000 academic term) students were told that there would be no formal lectures, but there would be weekly tutorials for assistance. In the redesigned delivery of materials online, students were told that there would be regularly scheduled weekly lectures, but all supporting information was presented on the web. Likewise, all assignments required use of the Web to complete computations, access data sets and other resources.

A comparison of conversations by both frequency and subject matter illustrates the perceived role of online delivery by students within their respective year. In the initial presentation, 1008 messages were posted to the course bulletin board, while only 77 messages were posted in the second year. Although both courses included the usual social banter, the "web-only" delivery included far more requests (and subsequent responses) for peer support. In the initial course, the weekly tutorials were attended by fewer students who in turn reported the tutorial discussion/highlights and important announcements to the class through bulletin board postings. In the redesigned presentation, the messages were less social, and more to the point, requesting specific information about procedures that were required to complete assignments. In the redesigned presentation the bulletin board was not used to share data or answers to assignment questions.

An example comparing bulletin board postings in each year is presented in Table 2. The reader will note the similarity in the tone of the requests, especially for those postings that are seeking direct assistance. The 1999-2000 postings included a greater proportion of non-statistics related messages than the 2000-2001 postings.

Bulletin Board Postings Year 1 (1999-2000)
This is to anyone out there. Our Sum of difference cubed score should equal our sum of difference score, that always being 0. This isn't happening for me. Since I know that the sum of difference cubed score should be zero, should I be recording my answer as 0 or as what I get. And when the webulators ask me to enter the sum of difference of cubed score to calculate for kurtosis, and skewness should I enter what I got from the webulators or 0. I m not sure b/c I have 2 possible answers?
This is to anyone out there. Just wondering if there is anyone out there willing to help with any questions I may have as we move through the course material. Sometimes a different way of explaining concepts makes them easier to understand.
First question. I'm starting to input data for assign. #1,page 1. How do we create a reporting table to record our outcomes for each data set? Second question: After I've entered data into input column, I pressed compute average slot and nothing happened. God am I the only moron who can't figure this out!!! Third question: How do we record the information in the recording table? To answer your question, YES I am completely Internet illiterate!
Hey guys, I'm not sure if I'm doing this right or not. Here's the numbers I got for Sum of the Squared Difference Scores: 1 1200 2 150.54 3 599420.22 4 5.117 5 8580.75 Can anyone verify these for me?
Just trying to do the assignment. I just don t get what they are asking me. Is it easier than I think it is? Let me know somebody. thanks, xxxxxx. P.S. how do you save the tables after you enter the data?
Does anyone know when the next (second assignment) is due? Hopefully it's not too soon??? I was wondering when the first quiz is for this class. Is it soon? Hey , it's XXXXXX, XXXXX and I are working on the assignment in the Computer building come on down...we will help you...
i think i kinda figured out how to do the assignment. giveme a call later. i'm pretty sure we were doing it right. i just don't know how to submit it or how to save it. okay peoples I'm a little confused! how do we hand in our assignments? do I email the the table to the TA as an attachment? what all do I email them, just the tables that I did in excel? does anyone out there know? can anyone help? please do... thanks, j
This is for you Dr. Montelpare. When I started the assignment I used all decimal places, but once you said that we could use two decimal places I converted over. This means that some of my answers will differ due to the change in decimal places I kept(not much difference though). Is this alright? I hope it is because it would take a lot of extra time to switch them all. Also, I have a question about the comments on the distribution, are they based on standardized skewness and kurtosis or just the regular skewness and kurtosis?
Well, I participated in class today, from my bed with my eyes closed. You see I set my alarm but

neglected to actually turn it on, so...If anyone could possibly fill me in to what went on in the tutorial class, notes, answers to questions and what not, please let me know. (I'll most likely find you anyway) Thanks.
Bulletin Board Postings Year 2 (2000-2001)
I was wondering if anyone knows what the term for a variable that is used to organize data is. Also, for the images in question 3 about skewness and kurtosis I'm not sure what to do. Do you describe both the skewness and kurtosis of each of the images. i know that some are negatively or positively skewed but then what is their kurtosis? Please help.
The instructions for this question are giving me a problem. Part 5.1 asks to compute values for males (total) and for females (total). Do I add all of the scores for all males and females together or do I do them separately and just have two entries for each box for set 1?? The same thing for Question 5.2. Do I combine the values for first and fourth year students or do I enter the values computed separately?? Please Help!!!!!!!!!!!!!!!
How many significant digits should we round-off to (2?) are we allowed to round our numbers and if so to what place.
Concerning the mode score . . . what happens when there are more then one number that occurs the most number of times in a given distribution?
I don't understand how to calculate the mean in Question 1.12. Can someone help?
I was wondering how I could meet with a TA. Hopefully before Friday's class
Can anyone help me??? For question #2, it says to indicate the variable types for each of the data points. Does this mean independent/dependent variables? or continuous/discrete variables? or a combination of both? Also, for question #5, is the confidence interval always 95%, or is there a way to calculate it? Thanks!
re confidence interval see page 9 of lecture (6) notes on web. here you will find 2 equations , you can use these to find confidence interval. hope that helps J student
Is this assignment due next friday as originally indicated in notes or on Tuesday as with the last assignment?

Table 2. A sampling of bulletin board postings in two years of course presentations

A comparison of course access

One of the many features available to instructors on WebCT is a student tracking routine. This particular feature enables instructors to "monitor how students are progressing through the course material"°[HREF3]. A comparison of descriptive statistics illustrating the average number of hits on the site by students in each year of Web delivery are presented in Table 3. Similar to the data presented in Table 2, the reader is alerted to the association between Web use and curriculum presentation method. Specifically, the number of hits by students in total and per Web page is a direct reflection of the curriculum presentation method. In the online delivery for the 1999-2000 academic year, the average number of hits by a sample of 94 students was 560°–°335 compared to an average of 122°–°79.5 for a sample of 51 students in the 2000-2001 presentation.

Course access in Year 1 (1999-2000)	Course access in Year 2 (2000-2001)
N of subjects = 94	N of subjects = 51
Mean number of hits = 560.5	Mean number of hits = 122.6
Median number of hits = 601.5	Median number of hits = 111.0
Mode number of hits = 22.0	Mode number of hits = 32.0
Std Deviation for number of hits = 335	Std Deviation for number of hits = 79.5
Std Error Mean for number of hits = 34.5	Std Error Mean for number of hits = 11.14
95% Confidence Interval for number of hits = 1.96 * 34.5 = –67.62	95% Confidence Interval for number of hits = 1.96 * 11.14 = –21.83

Table 3. A comparison of the average number of hits for the two presentations

A comparison of course evaluations

Finally, in each year of the presentation students were asked to evaluate the course. However, an inadequate sample of students in the 1999-2000 course completed the standardized University approved evaluation. These students did however complete the twenty item semantic differential scale evaluation form The results of the processed responses are presented in the following graph slide show.

In contrast to the 1999-2000 academic term, too few students responded to the twenty item semantic differential scale evaluation form in the 2000-2001 academic year to warrant a comparison of the results between the two years. However, an adequate sample of students had completed the standardized University approved evaluation in the 2000-2001 academic year to provide useful feedback to the instructor. In general, the students were content with the use of the online delivery as an adjunct to the presentation of introductory statistics. The student's perception of the instructor's preparation for lecture, and the instructor's level of knowledge were rated high, (mean=9.0 and 9.5 on the ten point scale, respectively). However, even though one might consider the extent to which the students felt that they had a positive learning experience high (7.6 on the 10 point scale), these values were lower than the average overall ratings of greater than 8.3. It is difficult to interpret this outcome when all of the determinants of a perceived positive learning experience were rated higher. For example, the average rating on the statement, "The extent to which the instructor motivated students to do their best", was 8.7; and the average rating on the statement, "The extent to which the instructor conveyed written information on course requirements, assignments, and evaluation procedures", was 8.5.

The results of the written comments indicate that students felt a statistics course should be taught through the traditional lecture approach, and not delivered exclusively on-line. For example, one student stated, "I think that this class should for sure be taught... I find that you can add interest to the topic and make it easier. I would encourage you to continue teaching and not just go back to the straight on-line method.".

Conclusion

A comparison of the features and foibles for the two courses suggests that the more readily accepted presentation approach is that which incorporates the on-line material with the traditional lecture. In the 2000-2001 presentation, the course explicitly reduced the role of the electronic curriculum in the delivery, while enhancing the importance of regularly scheduled lecture presentations. The compromise was to leave the course notes (including many scenarios and examples) on-line, but continue to present the elements of statistics through weekly formal lectures. The result was a learning environment in which students were required to "go on-line" to complete assignments, review course notes, or communicate with instructors and teaching assistants. In general, students accepted this latter teaching method more readily, and stated positive comments about the style of presentation. Further, expectations that an on-line delivery could provide a learning experience equivalent to traditional methods was minimized by combining the on-line delivery with the traditional lecture approach.

Future directions for this course will focus on expanding the methods used for evaluating the course, as well as incorporating a greater use of electronically generated theoretical examples to present statistical concepts.

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The Way of Significant Innovation: When Gutenberg Became Nonlinear

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Abstract

Nowadays, online learning is booming. Really "booming", actually: thousands of online courses, hundreds of researching groups, dozens of universities online. Eventually, Web Based Learning has left the labs, and begun a fruitful life in the "real world". However, quantity has little to do with "real innovation". In very rare occasions, online courses and teaching institutions are breaking with the rules of the Gutenberg Galaxy: the rules developed during five centuries of printing books. They are designed on a linear basis, and based on conventional text. But online courses' designers are not to be blamed: technology and economy of resources impose some hard restrictions. However, what if one try to put state-of-the-art technology aside for a while? What if one try to think exclusively in terms of cognitive efficacy? Then we will be able to create non-dependent on technology models for teaching online. We have done so, and now, after several years of work, we are able to present our "Full-Hypermedia Educational Systems Development Model", which intends to take full advantage (in terms of cognition and learning) of non-linear navigable structures (by means of exploratory learning) and multimedia (suggesting a sound way to present complex contents). Our aim is to think in a holistic, systemic way, being our assumption that, if we limit to try and apply state-of-the-art technology and resources, we will always be slaves of "technology's advancement pace". It is our opinion that online learning instructional designers must, after careful and "slow" analysis, ask for new features and facilities from technology, instead of trying desperately to use nowadays changing technology. A significant change in the point of view. That way, we will know how to take full advantage of new educational technology before it comes.

The Way of Significant Innovation: When Gutenberg Became Nonlinear

Introduction: "Click to turn the page, please"

For a minute, let's take in the role of a student who is about to begin his first experience of "online learning". This learner is obviously excited and willing to begin at once: not in vain anything related to new information technology is extremely appealing and fashionable. Learning by using the Web and email and chats and perhaps even videoconference, sounds appealing. But our student is feeling a little bit afraid too, and worried. He/she hasn't done this before, and doesn't know what to expect of learning using a machine.

Anyway, for good or bad, the student will be curious, in all probability. Eager to find out if the so called "new information technologies" are worth the try. And the experience begins

The first thing to appear (after logging in) is the homepage of the course. The learner reads the contents carefully and "Oh, great! There is a help page with instructions". He/she goes for it immediately, keeps reading for a while until this sentence turns up: "To go to the next page of contents, you just have to click on the arrows down the page". Our student cannot realize yet, but he/she has just discovered that everything keeps on being the same: a linear sequence of pages, ready to be gone through from the beginning to the end. A whole world of computers, software, Web sites, multimedia applications, sophisticated communications tools and our student is learning with a book in the end. A virtual book, a book with some videos and sounds, but a book, actually.

Can that be considered "innovation"? Being innovative must involve a certain amount of risk, in some way. You must do things in a significantly different way in order to innovate. Reflecting old habits in the Web is just an attempt to use new technologies in education, but it is not a way of searching for the "language of the medium"; it is not a way to get real improvement in educational processes. It is just a way to keep everything the same, though more fashionable, probably.

Even if courses add some navigational aids, interactive exercises, simulations and links to other Web sites of interest; even if they include tests and a virtual notepad and student tracking facilities (case of "Tonic", http://www.netskills.ac.uk/TonicNG/cgi/sesame?tng). Probably they will do wide use of email and discussion forums (Mason (1998)), as "Advanced Financial Management" (EMGT 452), http://www.umr.edu/~daily/. But in the end the structure is always the same: linear. "The Principles of Protein Structure Using the Internet" (http://www.cryst.bbk.ac.uk/PPS/index.html) and "Pentium Processor Training" (http://developer.intel.com/design/intarch/training.htm) are another couple of examples of very good courses that lack one only thing: breaking with the traditions of Gutenberg Galaxy.

All in all, perhaps it's about time to take advantage of the cognitive potentials of exploratory navigation in hypermedia networks. In practice, not only in theory. That was our aim when we began development of the "Full-Hypermedia Educational Systems Development Model" (FHESDM).

"You must be kidding Learning by browsing?"

Full-hypermedia means not just a sequence of pages with some links in-between. Not just a traditional linear book transformed into the Web's typical format. Full-hypermedia means more than one dimension.

According to Heras (1991), hypertext is like a sea: a plane, two-dimensional space where one must have the opportunity to navigate softly, not a huge Babel's Tower in which one's only option is to climb from the bottom to the top. A sea of nodes related to each other by links, making altogether a navigable network. We have called this plane the "Structural Dimension of Hypermedia". The question is: is it useful to employ the two-dimensional features of Web navigation in learning? Or, in other words, will we obtain better outcomes from our students if we make them navigate two-dimensional networks, instead of just making them "follow the line"?

After a long and careful analysis, we firmly believe in the existence of a positive answer to those questions.

First of all, hypermedia facilitates the use of exploratory learning (see Mayes (1990)). The student is no longer a passive observer, and now can browse freely around a virtual world that, on the basis of constant interaction, contributes to create a network of concepts in the mind of the apprentice (see Bayne (2000)). Some way, the user is offered a context where to play his own and personalized role (see Ascott (1999)). That way hypermedia allows the receivers of the information to build their own body of knowledge, according to their interests and necessities (see Cabero (1995)). It's a user-oriented reading process what we are referring to here (and so facilitating adaptive learning, according to Ruiz (1996)). Summing up, hypermedia is by nature a facilitating technology for the learner, not a directive one, offering the user the chance to build his/her own knowledge, using as a starting point the pre-existing associations in his/her cognitive structures (see Marchionini (1990)), and augmenting the "incidental knowledge", as a result of the browsing process (see Lee (1999)).

This leads to another important advantage of hypermedia: it permits the transference of the semantic network implemented by the system. Following the links between pages, the student assimilates the relationship every concept has to each other and the structure of the body of information (see Duffy (1990). It can be stated that a hypermedia system has a user oriented semantic relational structure, that is, a structure ready to be put into the user's cognitive schemes (that is to say, it is a potentially meaningful material). That is possible thanks to the parallelism between the "cognitive scheme" concept, as an mind's associative device to create knowledge, and the conceptual network as shown by a hypermedia system (see Kommers (1990)). If that network is designed intending to reflect the knowledge structure of an expert, then we'll be contributing strongly to replicate that structure into the knowledge schemes of the student (see Jonassen (1990)).

But, as usual, advantages and drawbacks come together.

You have to pay attention to the lack of narrative, for instance. According to Laurillard (1998) and Luckin (1998), narrative is fundamental to knowledge. Students are used to narrative: from television to books, every one-way communication device nowadays is linear. How will users react before a non-linear system, a system where each student must create his/her own narrative?

Another problem is the "cognitive overload". We wish our students to use all their mental capabilities to learn the contents, and that will clearly be more difficult if they have to cope with a non-familiar structure (see Lehman (2000), Plowman (1999), Lee (1999), Fern ndez (1997) and Mayes (1990)).

The third remarkable issue is fragmentation. The information is distributed in the network in too small nodes. But for some authors the most serious problem are the frequent interactions between the system and the user: argumentative structure is missed (see Plowman (1999) and Whalley (1990)).

We have analyzed very thoroughly all this. We have considered every implication for learning, and even recognizing the true danger all these problems represent for the effective use of full-hypermedia for learning, there is something we can by no means agree with: the suggested solution. Most authors propose to restrict navigation freedom, to impose linear constrains on the system, as the only way to keep it under control. However, that way we will be missing a great deal of the cognitive advantages that exploratory hypermedia can contribute to the learning process.

Our FHESDM has been thought as a way of minimizing the effects of the drawbacks exposed previously, but always maintaining what is for us the most valuable hypertext feature: its two-dimensionality, and the enormous opportunities for self-exploration it has. Accordingly, one of the main aspects of our model is the design of the information structure and of the navigation structure. Both ones will allow us to convey Structural Knowledge.

The structure of the system must be designed with an only purpose in mind: conveying a structure of knowledge. Certainly, our approach inherits the philosophy of Novak's Concept Maps (an actualized description of them and their educational uses can be found in Novak (2001) and Ca as (2000)), differing from them in two basic aspects: we propose a more methodical (and somewhat rigid) design of the network (in order to minimize the problems described previously), and we avoid showing an "aerial view" of the system to the student. If learning by discovery and exploration is a cornerstone in our model, the aid of a map from the very beginning may encourage an exploration of the woods as a whole, not of every tree and its relationship with the rest.

Though the detailed description of our work takes into account aspects like the division in modules of long courses, and the addition of some typical online facilities (homepage, introduction section, references, multimedia collections, glossary), its strength relies on the deep analysis every aspect of the information structure is subject to.

The process begins with the creation of a hierarchy of layers, in which any node is a summary of all the nodes that "hang" on it. That way, penetrating into the lower layers in the hierarchy means to obtain more details of previously presented concepts. On the other hand, going back towards the root of the hierarchy allows the student to see the knowledge space from a more holistic point of view. The advantages or hierarchical structures are explained in Shum (1990).

Once you have developed a hierarchical space of contents, it is about time to establish the necessary relationships between pairs or nodes. In an effort to keep a sense of modularity in the system, during these first steps in the design process you will limit to set links between nodes situated in the same sublayer, i.e., each set of nodes sharing the same father. That way you will be creating small navigational subspaces, whose "entrance" will be the father node. Any kind of structure is valid for each subspace (open circles as described in Heras (1991), random access, linear structures), and you will always choose the one that best emphasizes the semantics of the subspace.

Up to now, the proposed model looks fine, but there is little special, little different on it. This is a most suitable time to introduce a new element in the model: the "contract" concept. With it you will be able to superimpose several navigation structures upon an only information structure, allowing a more customizable way of navigating the system without using Intelligent Tutoring Systems (i.e., without taking over the control from the hands of the student).

Actually, contracts are a concept inherited from the Object Oriented Design and Programming world. There, the designer can group together all the methods in a class that hold some similarity (for instance, methods used to access information, and methods used to change information would be in different contracts, typically; see Wirfs-Brock (1990)). That way, one has several entries to access an object.

In fact, Object Orientation and hypertext have some very interesting points in common, suggesting that they could admit similar solutions. For instance, both are theoretical constructions rarely completely implemented in practice (most of the software systems that claim to be Object Oriented are just using an Object Oriented programming language. In the same way, many hypertexts are just a linear sequence of hyperlinked pages). And even more important: in both cases, structure gains importance versus contents.

Anyway, even if using an Object Oriented Design methodology to create hypertexts does not seem a good idea (differences are more abundant than similarities), adapting the contract concept seems really advantageous. For us, contracts will be the different sets of links a node can show to the student, depending on the path followed to get there. That way, an only node of contents can be inserted into several navigation structures, that is to say, into several ways of conceiving the knowledge space, all in the same hypermedia system (fig. 1).

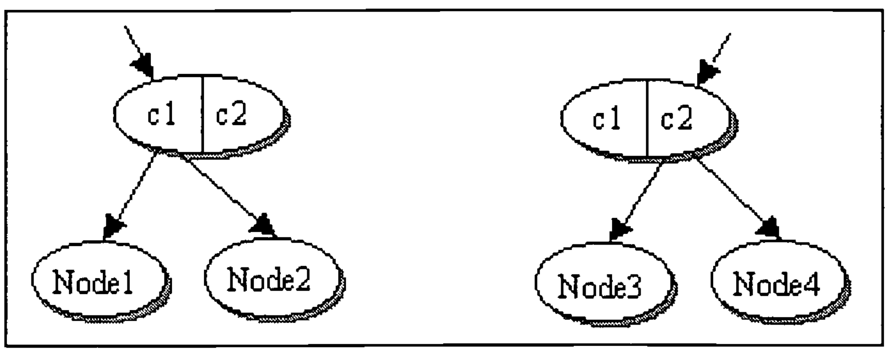

Figure 1: Node with two different contracts.

After applying all the ideas explained before, we have a semantically significant hierarchy of nodes, these grouped in well-structured navigable subspaces, and a collection of alternative navigational structures superimposed upon them. In other words, a system whose most important aim is conveying structural knowledge by means of exploratory navigation.

But that is not enough. Even if we have decided to avoid maps, we must provide some navigational aids. These are absolutely necessary to obtain the best results out of the system (see Eklund (1995), Sweany (1996) and Zeiliger (1996)). It makes no sense to rely on the learner's interests and expectations in order to realize a pedagogically sound navigation, without providing him/her with a full set of tools for him/her to take over full control of the system. After careful study, the selected navigation and metacognitive tools are: a bookmark, the possibility of reentering the system on the last node visited, the indication of the current position in the system, the recommendation of nodes to be read before the one visited now, the indication or the percentage of nodes visited yet, the possibility of linear navigation and "back-forward" buttons, and a notebook for the student.

"Ok, ok. But I hate to read on the screen"

Up to now, how to design the hypertextual part of the hypermedia system has been explained. We will move on to the multimedia one now.

After several pages talking about Structural Knowledge, probably other kinds of knowledge are missed. Declarative Knowledge, for instance. That is included in what we call the "Exposition Dimension" of hypermedia.

We like to consider multimedia as the third dimension of hypermedia: a set of vectors, each associated to a node in the network (fig. 2).

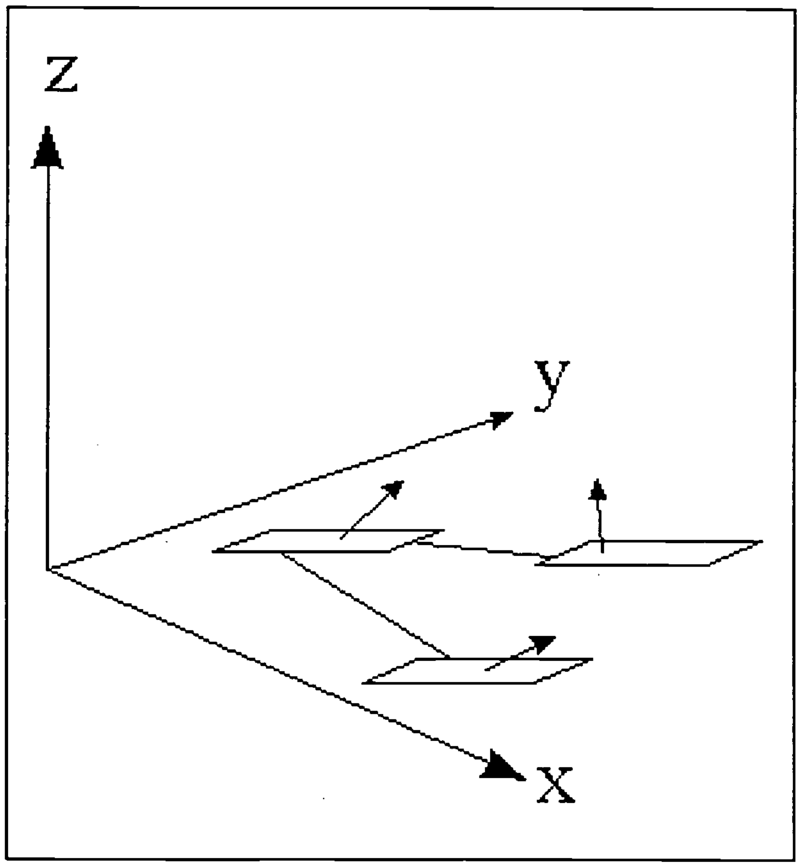

Fig. 2: Three-dimensions representation of hypermedia.

A vector represents the amount of multimedia information displayed by a node, and, of course, the way in which that information is displayed. The rest of this section will be devoted to justify and describe the way in which our FHESDM copes with this vectors, intending always to keep on the track of constructivism and cognitive efficacy: what we have so called the "docuscheme".

If you wish to convey declarative information, multimedia is a most valuable resource. Consequently, we have developed a cognitively sound model to present education oriented multimedia information.

One central idea is underlying the whole model: substituting text with pictures, video and sound. Not always, as text is too important in our culture to be completely eliminated. But as often as we can.

Reading on a screen is annoying and frustrating. People read on books and magazines, but nobody would be willing to read on a TV set, for instance. Screens are the land of pictures and animations, not of written words (web designers normaly recommend to limit the amount of text in a node, actually (see Hall (1999))). But does "eliminating" the main way of knowledge transmission in our culture make sense? Well, maybe yes, at least during the first stages of the learning process. Not in vain sight is the most important of the human senses: pictures are the best way to penetrate into people's minds, according to Buzan (1993). That fact is more evident nowadays: youngest generations have been grown up in front of television sets and computer screens (see Reyes (2000)).

Now we have to choose the most suitable kind of pictures. We prefer static ones, rather than animated (they are too "volatile"), and shocking to the perceptive systems of the student (this will encourage attention and retention, as mentioned by Trumbo (1998)). Besides, it seems interesting to provide a summary of the node's contents: let's employ an only picture then, captivating and eye-catching to the student, but at the same time behaving as a big scheme of the node's contents.

But we want to convey contents, not just a scheme of the contents. We need a way to put a large amount of information inside our fashionable node. One interesting possibility is audio. Audio is always a powerful communication resource (see McKillop (1998)). Using it to explain the scheme increases the amount of information conveyed by the node. What's more: by introducing oral narration in our system, we are combining static picture with documentaries' principles. We are getting closer to the concept of "Docuscheme", now.

In order to increase in an ultimate way the "information capacity" of our node, we could think of explaining every concept in the scheme by means of some kind of video, animation or whatever multimedia element the designer considers appropriate.

So now we have a big, colorful graphical scheme, explained by means of audio and acting as an "umbrella" that covers an enormous amount of multimedia information. It sounds fine: a node as catching as a documentary and as accurate as a textbook. Now we just have to add a few complementary elements.

First, accessing the information in a node in a film-like way (not in vain we are trying to imitate television documentaries in some way), i.e., from the beginning to the end without interruptions, may be fine for the first viewing, but not for the next visits to the node. Consequently, each part or the scheme must be accessible separately, once the student is inside the node.

Second, text must not be completely eliminated. Reading a textual version of the contents after viewing the full multimedia presentation may be a great opportunity for the student to analyze in full detail the information, to impose the student's information acquisition pace on the prefixed pace of video and audio. We must admit the text back in our system then, but only as a secondary element, a post-viewing resource.

Let's try to clarify the ideas exposed in the previous paragraphs by means of an example.

We will create a docuscheme to explain the Scientific Method. The main scheme would be something like the one shown in fig. 3, but visually more attractive, of course.

The first time the student gets this node, in a few seconds a voice will begin to explain the Scientific Method's main concepts. During the exposition, each significant element in the scheme will be exposed by means of oral narration and multimedia contents. "Observation" could be explained by a video showing a scientist writing down some notes and sorting the obtained data. For "Hypothesis", an animation presenting the deductive process would be suitable. A collection of static pictures with several laboratory items and some scientists doing experiments will work for "Experimentation". Finally, a last window could be associated to "Sample", including a subscheme to highlight the relationship between universe and sample.

After the last partial exposition, the main audio would conclude the presentation. Previously, this audio will have acted as a link between partial expositions.

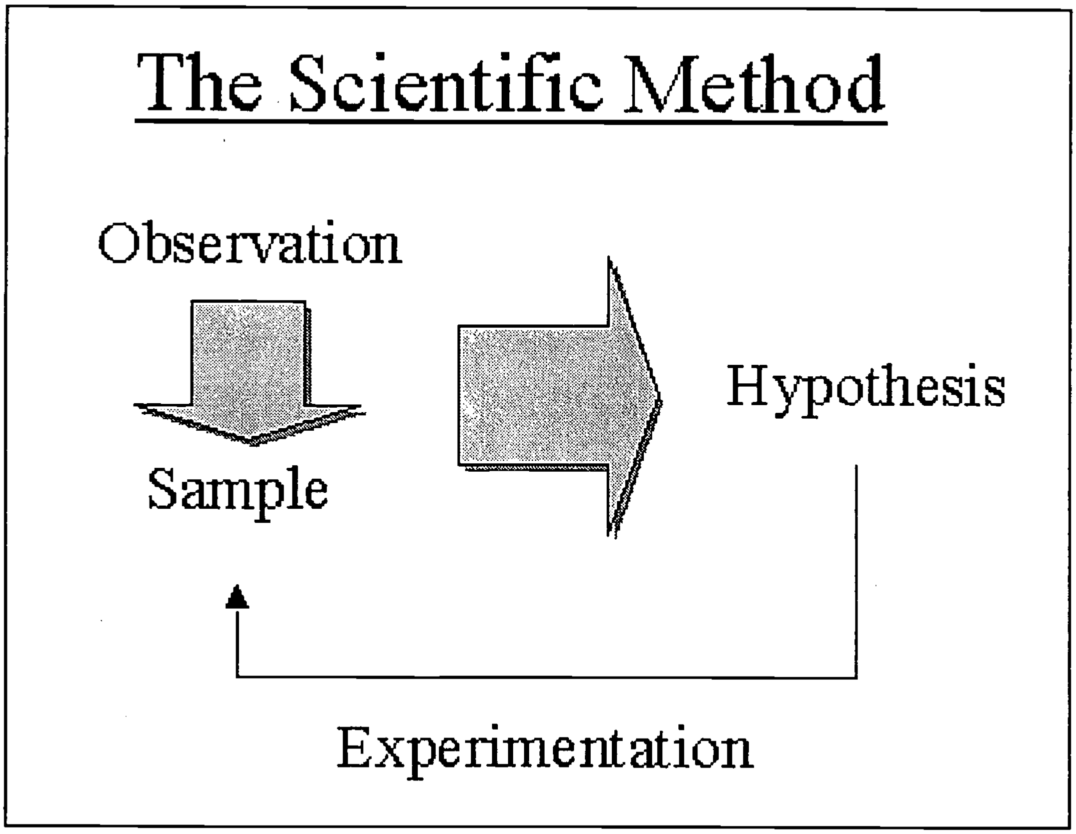

Figure 3: Docuscheme for the Scientific Method.

"Sounds good. Is that all?"

Though the core of our FHESDM has been explained, some additional concepts may be worth mentioning. They are just secondary aspects, but the efficacy of the whole model would be compromised if we miss them.

Structural Knowledge is essential, as it allows the student to build scaffolding in his mind where situating the rest of the information. Declarative Knowledge is also very important, because that is where the subject-matter information is. But our model still lacks the third kind of knowledge: Procedural Knowledge.

"Learning by doing" complements the "learning by exploring" and the "learning by watching" approaches used up to now (see Scott (2000) and Klassen (2000)). And the most common way to implement learning by doing in an online system is interactivity. But we mean real, full interactivity, not just navigating. What's more, we propose to separate very clearly interactive activities from the rest, more passive ones. That way, fragmentation is reduced, as expositions of declarative knowledge are not interrupted, as advised by Wild (1996).

In order to satisfy the interactivity (more specifically, the "separated interactivity") requirements of the system, we have created the concept of "satellite". Satellites are complementary nodes that "orbit around" a declarative node. Every satellite contains an interactive activity of any kind (exercises, tests, simulations, real examples, study cases) (fig.4).

The characteristics of a satellite depend strongly on the declarative contents it intends to complement, the available resources, the designer's objectives, etc. Anyway, we recommend notto display the satellite in the same window you are displaying the declarative node, but in a smaller, detached one: that way the context in which the activity is being realized will be before the eyes of the student constantly.

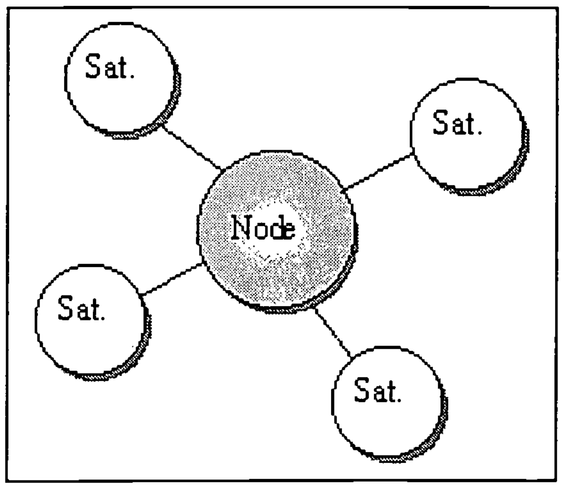

Figure 4: A node and its satellites.

But covering the three kinds of knowledge is not useful at all if you do not plan very carefully a pedagogical strategy. In this case, we use a "navigation in several phases" technique. That way cognitive overload and confusion are lessened, allowing a progressive approximation to the hypermedia system. This technique is not new (Zeiliger (1996) and Linard (1995) use it), but our approach is slightly different: our first navigation phase is the main one (not just an introduction, as usual), trying to make the student understand and assimilate the contents by means of his/her own interest and previous knowledge based exploration. In all probability, by the end of this phase the student could have missed some important concepts. The second navigation phase is an opportunity for the instructor to complete the learning gaps, making the student to fulfill activities whose aim is to get more profound understanding of the fundamental concepts (see Moreno (2000)). During the second navigation phase, the system acts like a "cyber-encyclopedia" for the student: a place to look for information.

Before the first navigation phase, a training process is necessary to teach the student how to employ efficiently the system, and after the second navigation phase, some kind of evaluation of the learning outcomes is unavoidable.

Finally, there is a last issue to take into account: interpersonal communications. Discussion groups and cooperative work are two cornerstones in nowadays Web Based Training. Probably that is the reason why we have decided to concentrate on information conveying instead of researching into interpersonal communications issues: a lot of researching is being doing yet in interpersonal communications. Anyway, our model does not eliminate the possibility of using this kind of resources, of course. On the contrary, it encourages it.

"Very convincing but do you have anything else apart from words?"

Though our intention was to develop a model beyond temporary technology restrictions, it seems somewhat important to introduce a real implementation of the model, in order to show that we are describing a feasible way of creating online courses. We will explain the technological items we are using for the time being, but always keeping in mind that, in all probability, they will change very often in the future.

The aim of our implementation is to develop a core of navigational aids easily adaptable to any set of HTML documents. That way, once you have the contents of the course, you just need to superimpose on them the core of tools previously developed to have the system running.

These tools have been built using typical Internet programming resources: DHTML (see Bobadilla (1999)) for the user interface, Java Servlets for navigation control and user tracking, and XML (see Floyd (2000)) for data representation (fig. 5).

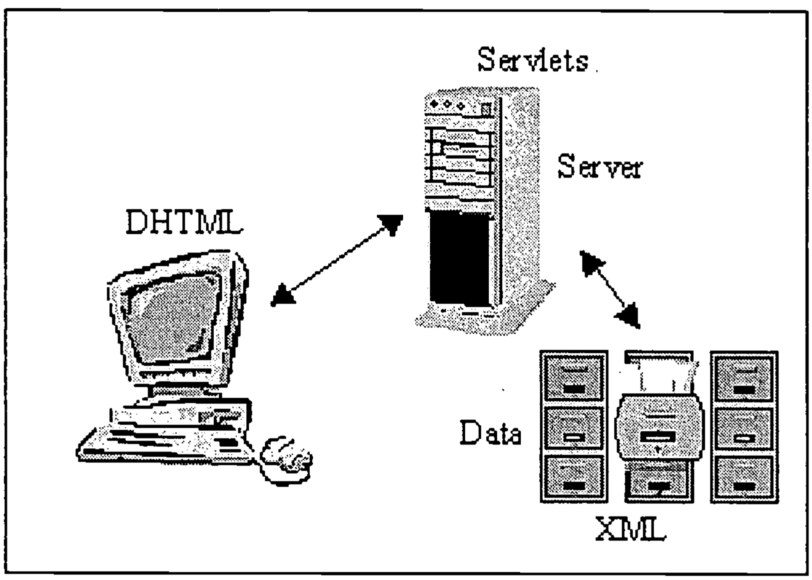

Figure 5: Nowadays implementation of the model.

This is a graceful way to implement the Structural Dimension. What about the Exposition Dimension? We are currently evaluating some options. Specifically, we are considering Java Applets, XML (SMIL, more specifically) with DHTML, and Macromedia Director or Flash. Though there is no definitive conclusion yet, for the time being we are using Macromedia software. The reason for this can be summed up with an only word: simplicity. The design process our model involves is rather complex, and it does not seem a good idea to increase the complexity even more.

There is also the problem of bandwidth. Although it is increasing very quickly, this still is the main obstacle to take full advantage of docuscheme principles in Internet. In the meanwhile, vector's graphics and streaming techniques are a good option.

Currently, we are looking for a personalized solution, as we do not think appropriate to depend on proprietary applications. Specifically, we are trying to combine Java applets with XML data representation, in order to create our perfectly customized "docuscheme's viewer".

Conclusions and future work

When we begun our research a few years ago, we undertook two premises: first, we intended to obtain something not depending on current, temporary technology; second, we wished to "make the difference significant", paraphrasing the famous "The Non-Significant Difference Phenomenon" Web site.

We accomplished the first by developing an abstract model. In our opinion, that is the only way to walk ahead technology, and not always behind. If we concentrate exclusively on applying the state-of-the-art technology, we will never be able to move fast enough: technology will always be faster, and bringing some kind of stability to online learning will always be an impossible dream . Abstract models, based on pedagogical and cognitive principles, give us the chance to "take over control" of the situation. We will ask technology for what we need, not the opposite.

The second premise is reflected in the kind of model we have created. If we put real technology aside, at least for a while, we can think in a "riskier" way. We can think of online instructional systems different from the habitual. In a word, we can work with features that help us to transform the use of online learning into a really significant difference phenomenon. We have tried to reach that point breaking with linearity and text, and making extensive use of exploration and multimedia: in our opinion, hypermedia is a comfortable "middle-point" between most innovative instructional theories (too innovative to be easily accepted by most nowadays teachers, actually), and the traditional teaching methods (the ones most often translated into online learning, without taking full advantage of the new capabilities of the medium). An easy first step into the path of significant innovation.

We have represented hypermedia as a three-dimensions space. Two of the dimensions constitute the "Structural Dimension", and intend to convey Structural Knowledge by means of navigation in a purposely structured hypertextual space. The third is the "Exposition Dimension", specifically designed to show Declarative Knowledge (i.e., reception learning). The "Docuscheme" is our conceptual tool for that. Summing up: the dimensional vision of hypermedia allows us to take easily into account several kinds of knowledge, and to face the design process in an easier way, by separating very clearly the design of the structure from the design of the information displaying.

Lots of research and development is still to be done. The path is long, and we have just begun to walk. We intend to keep on improving our model, realizing new experiments, and making up new ways to obtain full advantage of the Web. A long period of field testing is about to begin. And from a more technological point of view, we are planning the development of a software tool specially thought to make design work in our model far easier and convenient, eliminating routine tasks and facilitating collaborative design.

All this is worth the effort, undoubtedly. Not in vain, there is another dimension, a fourth dimension, in hypermedia: Meaning Dimension. And in the case of education and training, we must get an only outcome from that dimension: meaningful learning. No matter the amount of effort we must invest.

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From One to Many: Cultural Change in an Adult Learning Institution

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Abstract

Empire State College, with its flexible curriculum and outreach to adult learners, individualizes the learning experience for its students. Historically, the college has emphasized mentored, independent studies as a way of providing flexibility in both time and content. However, to meet the changing needs and networking capabilities of adult students, the college has transformed its independent study model into a wide palette of learning and advisement choices. As an example, the college recently began piloting the online delivery of its Community & Human Services (CHS) degree in an attempt to meet student needs and develop a networked community of practice among CHS participants. Providing a wider variety of choices better reflects the college mission as student needs and the pedagogy of adult-centered learning evolve.

Keywords

Networked learning, adult education, community, human services

From One to Many: Cultural Change in an Adult Learning Institution

Introduction

Once one gets past the dazzling array of information available in cyberspace, just what is the Web good for? The knowledge supplied online is easily accessed by most users with a computer and a modem but, once found, what next? The Web can also serve as a source of virtual community and a meeting place for like-minded individuals regardless of their background, occupation, or appearance. Bulletin boards, listservs and virtual domains like MUDs and MOOs (Multi-User Domains and MUDs, Object-Oriented) are a breeding ground for that elusive yet desperately sought-after commodity in modern life a sense of belonging.

This paper will briefly review the phenomenon of community on the Web in business and education, and then present a case study of one college s efforts to change its culture of learning from one-on-one mentoring to a networked community of learners. We will discuss the opportunity created for students to select among various degrees and types of interaction, as well as the organizational and technical challenges this change in pedagogy has posed.

Divide in the Digital Age

Founded in 1971, Empire State College (ESC) has the mission of providing accessible, high-quality education to adult learners with the secondary goal of exploring new ways of teaching and learning. The college offers 2-year and 4-year degrees (as well as Masters programs) at more than forty geographically-dispersed *centers* around New York State. At ESC, a primary belief of the founders was that learning could occur anywhere, not just under traditional academic circumstances. Individually-scheduled faculty-student interactions, year-round enrollment, customized degree plans, and rural and urban centers were mechanisms to eliminate problems of time, curriculum, and physical access for students in the midst of careers and family life.

Today ESC students choose from a range of study and resource options, from totally online degree programs to small groups meeting face-to-face to explore special study topics.However, historically there has been a heavy personal investment by Empire State faculty in working face-to-face with students in individualized meetings, both to *tutor* student-designed *studies* and to *mentor* students over the course of their college careers on the direction of their education. The student-generated *degree plan* is the key document in this highly student-centered environment, rather than a traditional "one-size-fits all" degree program imposed on the student by the institution.

For both students and faculty, mentoring lies at the heart of the Empire State College experience. Students will entertain one another with stories of the horrors of degree-planning or speak movingly of the influence of their advisors in motivating them to complete their educations. Many faculty members view their ability to help such students find their own voice as the key factor that keeps them at the college.They pride themselves in carrying out their job of mentoring in their own individual style and prefer to be called *mentors*.

In this setting, technology provides new choices for teaching and learning, but it comes with the potential for disrupting these student-mentor relationships. While some students are not completely comfortable with computer technology, many see it as a tool that can assist them in attaining a degree without having to entirely rearrange their lives. Such students actively seek networked options for learning, while many faculty members are still struggling to find the time to explore technology s potential to support learning. Computerization then becomes a source of some challenge, even as it becomes an avenue for change.

Even when willing to work online, some faculty members desire to maintain the core of their individualized mentoring style in the online environment. Philosophically, these mentors are heavily invested in the results they can achieve in individual face-to-face meetings with their students. They are therefore mistrustful of computer-mediated communication (CMC) since they see it as lacking immediacy or intimacy with their students. They attempt to replicate the strategies that have been successful face-to-face and are disappointed when they fail.

In addition, many faculty worry about inclusion and barriers to access -- especially the problem of reaching students in areas of urban poverty who do not have computers available or the funds to pay for Internet access. Or they fear that funds are being diverted into online programs that should be used to increase the scope of personal interaction.All of these issues are expressed as concerns about technology when online course delivery is mentioned in many centers (Davis, 1989).

Nuances of these conflicts become apparent when faculty talk about specific technologies. Some mentors have described mentoring with an Web course template as being more "traditional" (and less student-centered) since it requires the faculty member to frontload information into a set of predefined modules and to decide up front and without student input how the course will be presented.

But other mentors have found that CMC is an excellent way to reach students and feel that the power of CMC should not be underestimated either for teaching/learning paradigms or for student communications. Mentors who support online education see immediacy and intimacy as occurring throughout the virtual format, regularly claiming that networked students participate more fully in online discussions than do students in other formats. These mentors also observe that more students complete their courses (and complete them on time) than students taking individual studies.

Finally, anecdotal reports indicate that networked CMC makes it easier for mentors to deal with confused or "difficult" students. They can address the concerns of these students more promptly and have prior postings to use to gauge evolving difficulty.Consequently mentors say they are able to step in to solve student problems before they become unmanageable.

Theories of Learning and Adult Learners

With its unique instructional approach and student body, ESC has a strong vested interest in Adult Learning Theories. These theories recognize that the most important differentiating experience adults bring to learning is their cumulative life experience which can be used to incorporate adult learners into situated practice communities. The skill learning students achieve in these communities differs from the "education" expected from traditional students. A number of adult learning theories focus on the factors that bridge the divide between life experience and situated "learning."

Lave & Wenger (1991) advocate learning in a situated context. The educational experience should be designed to help learners bring old and new information to bear upon a specific situation of which they are a part. While the resulting *community of practice* may have diverse member representation and experience, people will share notions common to the community and inculcated from one member to another. Their practices begin to form a social contract which promotes mutuality and the active construction, sharing, and maintenance of knowledge. People pick up the skills of the community as they engage in *limited peripheral practice.*Beginning with simple but relevant tasks, new members gradually learn the skills that enable more experienced practitioners do their jobs. Increasing the complexity and scope of the tasks these members undertake, and using the artifacts of the community to build common knowledge and group identity, enables beginners to advance in status. Thus, within the context of a community of practice, nurses learn to deliver nursing care to the ill; butchers learn to cut meat in the shop; and human service workers learn the art and practice of service delivery by working with clients and engaging in interactions with experienced practitioners (who may include their peers.)

A related theory proposed by°BurtonCity, Brown and Fischer (1984) is the notion of°*increasingly complex°microworlds.* Learning a simplified version of a final task assists students in mastering more complex skills successfully. The initial task often requires sequential learning of related°subskills, with the skill complexity increasing over time. In creating a°microworld, the instructor assists with skill execution by manipulating the physical setting and specific tasks. Teaching students to reflect upon the conditions of learning becomes more important than total time on task.

Coaching is an important aspect of both these situated learning processes. Coaching helps students acquire the right°subskills, turns non-constructive experiences into constructive ones, and teaches students to recognize errors and give clear instructions. By offering suggestions, demonstrating technique, or pointing out possibilities for skill development, coaches are more important at the beginning of skills acquisition than later on, when students can self-coach and have begun to understand the cultural mores of the community. Coaches must also decide when students can move on to another range of skills (so that bad habits based on partial knowledge are not acquired) and when students need their exploration guided to insure their safety and eventual mastery (Burton, et. al, 1984).

ESC's commitment to personalized mentoring has been the most visible sign of its exploitation of these elements of adult learning theory and its commitment to adult learners.

Developing Online Courses: Problems of Design

A study by Mancuso (2001) on best practices in adult-centered educational institutions found that appropriate adoption of technology is essential in such college cultures. "Flexibility and expectation of change pervade every aspect of the institution." (p.169).°Among the many aspects of flexibility that the authors identified is the willingness to use technology to link directly with students "any time and virtually any place to provide them with the information they need" (p.177).

However, the traditional process of developing ESC studies -- student and mentor working one-on-one to craft a highly personalized and individualized learning contract -- is upset by the desire to create a networked student experience. An interactive model based on predetermined course templates exposes several critical questions: oWhat is the goal of the experience -- that is, after students are done interacting, how differently will they behave online and in their real life as a result of the interaction? oGiven a defined goal, what experiences will assist students in achieving the goal? oFinally, "What cool things can *students* do?" (Kozel, 1995) Many programs focus only on what the program or the programmer can do. The driving force at the heart of every interactive design project should be how students can do new and novel things that expand their knowledge horizons. [HREF3]

Encouraging students to do interactive, self-directed things surfaces the issue of authority. What level of direction is appropriate? Tourists let someone else decide the sights worth seeing. Travelers guide their own journeys and make their own decisions about what they will do.Users of Web technology have the potential to be travelers within a°microworld created by the course designer and supported by coaching from faculty. Lessons learned from business and educational applications reveal that successful online design gives users a simultaneous sense of opportunity and control (McAdams, 1995).

In the design of online courses, the environment accessed by the student needs to be consistent, predictable, and transparent. Four parameters are critical:

1. Concept: Choose an explicit metaphor to frame the student experience

2. Visibility: Clearly allow students to see what to do now and what they might do next

3. Good "mappings": Allow students to recognize the relationship between their actions and the results

4. Feedback: Let students know what their actions have caused to happen. (McAdams, 1995, p.43)

An equally crucial design goal is fostering online community. Situated learning theory depends on the ability of students to interact and learn from one another. Students need not traverse cyberspace --°nor their educations -- alone.

Online businesses early recognized the benefits of community in facilitating effective transactions.°Grygo (2000) identified five factors essential to effective online communities -- clear benefits of online interaction, content geared to community needs, transparency, common interests and goals, and providing the participants with an immediate ability to respond. Williams and°Cothrel (2000) found the following principles helped build community in online businesses:

- Clarify, but don t be Big Brother

- Understand members' needs, even if you must read between the lines

- Stimulate conversation and keep it going

- Put members at center stage turn the conversation over to the group

1. Show a personal, human side

- Keep the discussion open to monitor member satisfaction

They simplified these elements into three categories -- member development, asset management, and community relations -- which can be applied to educational as well as business enterprises. In educational circles, these principles would require:

- Definition of learning goals, modular curriculums, and designed interactions (to support member development)

1. Application of instructional media and tools (to facilitate asset management)

- Commitment to learner support systems and services (to promote community relations) (Ragan, 1998) [HRE F2]

At ESC, member development is driven by adult learning theory; asset management requires the application of the best principles of networked instructional design; and community relations are handled by the college's Center for Distance Learning and the help desk of the State University of New York's SUNY Learning Network.

Empire State College's Center for Distance Learning

With the establishment of the Center for Distance Learning (CDL) in 1979, ESC moved to a blended resources model for the delivery of studies. CDL initially offered print-based distance learning and, later, made online courses available to students worldwide.

Paper courses usually consist of textbooks, course study guides, and assignments mailed to the student s home. Contact with the student is made by phone, mail, or email by the instructor. This approach allows students to complete courses wherever they like in their own timeframes (Lefor, Benke and Ting, 2001) [HREF4]

Online courses are developed and taught by CDL using the infrastructure of the State University of New York (SUNY) Learning Network (SLN).SLN provides the servers, platform (Lotus Notes), templates, and student administration for instructors to create online courses for all 64 campuses of the SUNY system. [HREF5]SLN courses differ from Empire State College studies in two ways. First, there is a pre-structured curriculum with fixed course modules and assignments rather than a learner-generated contract with learning activities designed by the student and faculty member. Second, cohort groups take these courses during five fixed terms, a big change from individual open enrollment which allows students to enroll any week of the year for 16-week contract periods. As distance learning students take more online courses, they develop expectations based on familiarity with the template that increase the usability of the interface and support the workflow of their courses. Many adult students at ESC say these online courses are the best way for them to deal with multiple demands on their attention, time, energy, and resources.

However, another consequence of their choice is a change in their relationship with their mentor. Students accept less independence in shaping their studies; mentors evolve from guru to coach. These role changes are important in the conduct of individual courses, but they also affect general ESC pedagogy by undercutting the centrality of individualized mentoring and advisement. Picking courses from a catalog is very different from designing one s own study.Many students want their mentor to point out the academic trail that will allow them to reach their goals in the most straightforward way. Students who look for this guidance see a direct benefit from structured online education; some mentors find the change from student-generated studies very difficult to accept.

Depending on how long they have mentored at ESC, faculty express strong feelings about the need to carefully shape student goals. Some fondly recall the original mentoring approach as a transforming experience; one person described it as the "let s sit on a log and talk about life" approach. Others see mentoring as more pragmatic -- some students may desire transformation but mentors should also respect the right of others not to explore their philosophy of life and education.CitingESC's highly student-centered environment, these mentors feel that students who want to focus on more limited goals are entitled to make this choice.

Students and mentors who share this practical view of mentoring often find each other in the context of online learning. Students and mentors may belong to any of ESC's many centers or the student may choose to affiliate with the Center for Distance Learning. The CDL provides many of the same services as ESC's other centers -- mentors teach and advise, students work with mentors to design their degree plan and consult with them about educational options.However, the ability to take online courses adds more academic structure and potentially more peer support.

Educational Planning Online

Whether a student takes individual studies or online courses, the pivotal document for everyone at ESC is the individual degree plan. This plan is central to the development of the student s overall program and requires intense collaboration between student and mentor in a study called Educational Planning. The student also writes a *degree plan rationale statement* that justifies the areas to be studied and explains the types of instruction to be used.

The degree plan and rationale are submitted to a formal academic review which verifies the integrity of the plan as an academically sound program of studies. Typically, development and writing of the plan and rationale involve the student and mentor only. Some faculty set up study groups, offering interaction and support for students who can attend the group, but degree planning tends to be a difficult, lonely, introspective process for most students. Individual discussions with one's mentor, self-assessment, and the writing of short papers serve to clarify the conceptual framework of the student s program and are well-accepted pedagogical tools college-wide.

Within the past 3 years, Empire State College has developed Educational Planning as an online asynchronous course on the SUNY Learning Network. A wide number of mentors and facilitators assist with the two-part course. Not only do students participate in individual discussions with their mentors by phone or email, they can join asynchronous discussions with other students in the course.

In the first part of Educational Planning, discussions are primary, ranging from such topics as "What is an educated person?" to "How does all of this fit in with my life and work?" The goal is to engage students in a broad consideration of education and the consequences of their proposed educational choices. Toward the end of the course, each person produces a draft learning contract which is then shared with their mentor and others in the course. This learning contract outlines the process the student needs to follow to receive credit for life experience in addition to addressing the formal requirements of a SUNY degree.

In the second part of Educational Planning, the focus narrows. Discussion and written work center on analysis of sample degree plans and rationales for these plans. Students debate details of the plans to help them refine their own thinking and writing.

Students talk with their mentors (online, by phone, or face to face) and post individual questions to mentors about each portion of the course. However, online Educational Planning soon goes beyond one-to-one interactions as a discourse community emerges among a diverse group of students and faculty. The medium allows thinking and learning to be shared with others anytime and anywhere. The progression of learning and planning is intended to move students from a dyadic relationship with their mentor to discovery within a networked community of practice. As Educational Planning continues and students seek to contrast or support their own plans, they begin to refer more to one another and the experiences brought up in discussion and less to their mentor. The development of this sense of community within the progress of this particular course presents an opportunity to develop and support a cohort of students taking the same online degree.

The Networked Community and Human Services Group

To test this hypothesis, a pilot group of students in Community and Human Services (CHS) was recently recruited to pursue their degree entirely online, beginning with Educational Planning. CHS students in ESC's more remote locations often lack access to mentors with a specialty in CHS who could help them make educational choices. The goal of the online CHS degree is not only to increase access to appropriate mentors, but to develop an intentional networked community of practice to support CHS students throughout their college careers. Two pilot groups took Educational Planning as part of SLN's Spring and Summer 2001 course offerings.

Community and Human Services is a diverse concentration. Nurses, social workers, police officers, nursing home administrators, mental health advocates, and many others serving the public in one form or another seek this degree. Luckily, diversity of viewpoints and experience is valuable ground in which to begin a healthy community of practice. One of the students' first tasks is to introduce themselves to one another in the area provided for this on the SLN template. Faculty and people providing technical and research support also introduce themselves here, fostering the development of self-awareness as a special CHS pilot group.

The goal of the initial Educational Planning discussions is the active construction of knowledge from an adult learner viewpoint, rather than the passive exhibition of knowledge for a teacher and a grade. The initial identity-building work gives way to problems that can only be solved by the group with its faculty mentors. The development of a common language of degree planning becomes the first step in molding the students into a community of practice as learners and human service professionals. As Lave and Wenger (1991) recommend, limited peripheral practice assisted each learner to embed knowledge and develop the context of a shared culture.

With surprisingly few technical concerns (all easily handled by the SLN Help Desk), the students quickly took to the online medium and were soon exchanging life histories and discussing their education goals. However, the faculty mentors supporting the pilot group took longer to achieve the same level of comfort. While secure in their academic identities, most of the faculty were teaching online for the first time and were less confident of their technical skills. When the course began these faculty members were uncertain of how many students would be in the course, how and when to post replies, or what degree plans would be provided as models. Instructional support was made available to each new faculty member, and they began to observe and copy the way more experienced mentors facilitated discussions in other areas of the course. By learning customs unique to the virtual environment, faculty mentors began to model appropriate behaviors in response to student questions and postings. As they began to "point the way" to more complex levels of analysis, these faculty members were transformed into proficient facilitators of shared knowledge.

One experienced faculty member shared his view of mentoring as responding with frequent, open-ended, and provocative statements to the students. He saw it as incumbent upon faculty in the beginning of any course to respond to each student s initial postings. However, after mentors "shape" the direction and format of the discussion with targeted postings, they should stand back and allow the discussion to evolve. This faculty member felt that it was the exchange between students, rather than the expertise offered by the faculty, which is the most important factor for success online.

In a healthy community of practice, members share a tacit social contract to help each other to further the practice. Lave and Wenger (1991) found that the development of a community culture requires contact with fellow practitioners and shared tools, materials, history and anecdotes. In other words, it requires the development of metaknowledge -- knowledge of the process of making knowledge. Over time, Educational Planning faculty began to request the creation of virtual spaces outside the classroom discussion modules for casual interaction between the CHS students and themselves. The SLN template was customized to create areas to "center" the evolving community and to provide a space for sample degree plans specific to the discipline. Other community artifacts like the virtual "coffeepot" became cultural icons for the CHS group.

The CHS students took advantage of these spaces within the course to interact, ask questions, and begin to transform themselves from isolated, individual learners into a cohesive community with contributions to make to a group identity. The virtual "Student Roundtable" allowed the CHS students to discuss any topics they liked, thus increasing the sociability of the group. The "Research Corridor" gave students the ability to work with the pilot project research coordinator in an asynchronous virtual space. The class "Bulletin Board" let students post questions and answers to technical problems dealing with the overall delivery of the course. Students sought reassurance, exchanged encouragement and goals, participated in the project's research programs, and offered solutions to each other's technical dilemmas; by the end of the course, they felt they were developing a well-rounded knowledge of each other and the requirements of the CHS profession.

Conclusion

So, what is the Web good for? If you are an adult learner rather than a traditional student, it may be a venue for developing a new sense of self through a community of practice. Well-designed courses and degrees can foster academic and social exchanges with peers and mentors. This networked community of fellow learners can enable adult students to achieve both practical and transformational goals. Students can choose their level of involvement according to their personal needs.

If you are a mentor at a nontraditional college for education, the Web can help you be more effective in moving students towards their educational goals. Because of its unique pedagogy, Empire State College is well-positioned to help students develop a community of practice. The college has historically reached out to adult learners with a flexible curriculum, faculty mentors, and individually crafted studies. This educational philosophy allowed students to individualize their learning experiences and provided flexibility in both time and content but it did not necessarily build community.

Today, the needs of adult students are changing. They are under greater pressure to become lifelong learners in a work world where knowledge is less important than practice. They work in environments where networked communications are the norm. To meet their needs and to take advantage of their networking capabilities, Empire State College has begun to transform its independent study model into a blended services model that offers a wide palette of learning and advisement choices.

Students can now choose from a repertoire of group studies, print-based distance learning, and online course delivery, as well as the individual mentor-student relationships that have been the hallmark of the college. The new Community and Human Services degree has become a testbed for developing new initiatives that more fully support community. Through online Educational Planning, students learn the vocabulary and contexts of a new professional identity. Mentors have become fellow learners and coaches in a group process of situated learning.

The CHS degree will provide additional challenges and opportunities for transforming ESC pedagogy. Future research needs to consider the longevity of group cohesiveness, the impact of a more structured form of degree planning on students' completion rates, and the effect of computer-mediated communication on faculty mentoring strategies. So far, students and faculty say the Web is good -- and look forward to the opportunity to make it better!

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HREF1 http://www.esc.edu/

HREF2 http ://www.ed.psu.edu/acsde/deos/deosnews/deosarchives.asp

HREF3 http:// www.kipinet .com/mmp._nov95/Design_Model_word.html

HREF4 http://www.irrodl.org/

HREF5 http://sln.suny.edu

Web Portals at Southern Cross University: Supporting Staff and Students

Allan Ellis, Southern Cross University (Australia)
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Abstract

This poster presents an overview of the history of Web usage at Southern Cross University, an inside view of SCU's portal deployment, and an indication of SCU's plans for future Web portals and services.

Web Portals at Southern Cross University: Supporting Staff and Students

The Web Comes to Southern Cross University

Southern Cross University (HREF 1) was an early adoptor of Web technology having its first server online in late 1992 and a university home page up in early 1993. The earliest Web-based courses were developed and offered in 1995 and 1996, and were "hand stitched" mixes of text and images with some downloadable audio files. They were used in conjunction with email lists that were archived to a Web site. Details of the first 10 years of the Web at the University are provided in Ellis and Sawkins (2000).

Course Management Shells

In mid 1998 the decision was taken by the University's Executive to develop two full undergraduate degree programs online. This lead to the adoption of the commercial product LearningSpace" (HREF 1) as the course development and delivery shell. Many problems were encountered with this initial shell, which lead to the decision being taken in late 1999 to phase it out over the next 12 months and replace it with a new course shell, Blackboard's product CourseInfo" (HREF 2).

The First Web Portal

The concept of a personalized portal for students and staff was first mooted with the University Council in early 1999. In this proposed model students would be able to select and vary their study plan, pay fees and transact generally with their university online as well as study online and access all their support resources. A few months prior to this, the University had embarked on a major initiative to re-develop its Web site.

The first student and staff portals were released early in 2000. Each provided an access point to a range of information and support services: the library, computing, student administration, human resources, and learning assistance etc. Each page, in addition, displayed information under headings such as: what s new, hot links, and key dates. There was no personalization at this stage.

First Personalization

The introduction of a second centrally supported Web-based course management system mid-way through 2000, provided an ideal opportunity to also introduce the first element of personalization into the portal. In addition to all of the resources provided in the original portal, all students were now able to log on to an environment that welcomed them personally, provided links to the courses they were enrolled in, access to various personal organizers (calendar, tasks, address book), and the ability to participate in university-wide discussion forums.

Several months later, the staff portal was similarly personalized, with access points to all the units the staff member was teaching or developing online.

What do the portal sites offer now?

The current iterations of the portal sites have retained the same look and feel. As new services came online (e.g. viewing exam results, library online databases, and student s online classifieds) these were linked through the portal.

In early 2001 the university began development on the student portal to incorporate a range of new features including the ability to select externally sourced content (e.g. news, weather, sporting results) and to update the look and feel. The proposed portal, however, did not pass our user acceptance test for download speed so this upgrade was held off till solutions could be found.

What is planned for the future?

No single look and feel has a long shelf life and a re-vamp of the student portal is underway which will incorporate improved design and navigation features. With the evolution of new student administration and finance systems, it is now possible to provide a Web interface into these systems. This will allow a major leap forward in transactional capacity. A student self-management area is currently in pilot release and the financial component should not be far behind.

Longer term, both technical and information management issues that we face include complying with legislation on privacy, single sign-in, secure e-commerce capability, technical challenges related to new browser versions, and the move towards XML standards enabling use of mobile computing devices.

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Hypertext References

HREF 1 http://www.scu.edu.au

HREF 2 http://www.lotus.com/home.nsf/welcome/learnspace

HREF 3 http://blackboard.com

Development Of An On-Line Resource For Undergraduate Biomechanics

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Abstract

This presentation will highlight in a stepwise fashion the pedagogical considerations for integrating animation, video, graphics, text and the communication tools of email and bulletin boards into an undergraduate biomechanics course environment. Applied biomechanics is well suited to the application of web-based learning because it is a science which analyses and describes the mechanical principles that govern human movement. Principles, constructs, and applications can be dynamically presented through the virtual medium of the Internet. The required undergraduate course defines biomechanics and its relationship to a knowledge of human movement fundamental. Basic mechanical concepts and principles as they relate to the analysis of human motion are studied. Examples of human movement commonly observed in the areas of sport and exercise science, physical education, physical rehabilitation and ergonomics are employed.

Development Of An On-Line Resource For Undergraduate Biomechanics

Introduction

The School of Kinesiology at Lakehead University has established itself as being an innovative and unique academic unit. Its distinct dedication to an applied and practical scholarly orientation has earned international acclaim.° An Introduction to Biomechanics is a required second year course in the Honours Bachelor of Kinesiology program. The course defines biomechanics and its relationship to a knowledge of human movement fundamentals. Basic mechanical concepts and principles as they relate to the analysis of human motion are studied. The field of applied biomechanics lends itself to on-line learning applications as the medium can be developed and presented to provide students with an opportunity to visualize, and experiment with, the application of mechanical principles to moving bodies and objects. Students enrolled in An Introduction to Biomechanics meet with the professor for three hours of lectures and a two hour tutorial session each week for a 12 week term. °

The On-line Resource

A customized on-line resource was developed for this course and is presented through the UNIX based WEB-CT software. The resource contains important definition of terms, detailed explanations, numerous examples and graphics, and web-based calculators(the webulators).

The resource consists of six units which correspond to the lectures and practical work completed during the course. The presentation is based on hypermedia graphics, animation, and artificial intelligence. The resource is aimed at individualized learning with an emphasis on learner control. Students can proceed through the sections as fast or as slow as desired. Key concepts have been amplified in successive layers of hypertext to be accessed by those students wanting greater depth. °

The Presentation

Our goal has been to creatively and effectively implement the features of a computer enhanced resource within the traditional course environment. This presentation highlights the program of teaching we have developed for this course by demonstrating the animation, video, graphics, text and communication tools used in the resource, and by discussing the pedagogical considerations for their implementation. °

Recognition of Conative and Affective Behavior in Web Learning using Digital Gestures

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Abstract

It is reasonably easy to understand a student when in a classroom. Learners can be uniquely identified, content can be specifically presented, and advancement can be individually supervised, maintained, and reviewed on a regular basis. In addition, study has found that conventional classroom (mainly of cognitive type) solution, are not always workable in the online setting. Lately, companies offering web-learning courses often tend to elucidate on conative and affective attributes of learners. These attributes are more stable over different online learning circumstances. These companies are discovering the requirement to set their focal point on the conative and affective factors that influence learning. Many contemporary researchers have extended their research on learning and memory constructs (and associated measures) to include conative and affective but very few have successfully deciphered these perspectives into technology. Human gestures are nothing but psychosomatic motions, which evolve due to the communication between the mind and body. These Human gestures give rise to digital gestures in an online environment. Keyboard press, mouse movement, page tracking, hyperlink usage, scrolling rate etc. are some of the Web usage characteristics. Web Mining is a way to search for "interesting" relationships in Web data. It has immense potential in discovering some decisive knowledge like conative and affective elements that will help the company provide learners with better learning experience. Primarily they need to identify the dominant power of emotions and intentions on learning, and then, seek personalized solutions to revolutionize the presentation of learning. This paper highlights on how conative and affective attributes of a learner can be transformed to real-time data and analyzed using Web Mining. Finally, our approach would be to discover several learners with similar psychological characteristics and their grouping will help us achieve mass customization.

Keywords

Personalized Learning, Web Mining, Clustering

Recognition of Conative and Affective Behavior in Web Learning using Digital Gestures

Introduction

The focus of this paper is how we can discover prime psychological attributes like conative (desires, intentions) and affective (emotions, feelings) behaviors in a complex system like the World Wide Web. We first try to understand the necessity of personalized learning. Then we explore the world of Digital gestures, which is an outcome of Web Mining combined with Data Mining to produce some interesting results about an individual or a group at large. We also draw a connection between the collected data and the psychological factors. The critical component of this analysis is how we can associate the behavior of numerous individuals and cluster them together to perform mass customization.

Need for Personalized Learning

The Web offers the perfect technology and environment for personalized learning where learners can be uniquely identified, content can be specifically presented, and progress can be individually monitored, supported, and assessed. Technologically, researchers are making rapid progress towards personalized learning on the Web using object architecture and adaptive technology. However, missing still is a whole-person understanding of how individuals learn online (more than just how they process, build, and store knowledge). Primarily cognitive solutions originally designed for the classroom solutions (and facilitated by instructors) are often not enough to meet the individual, sophisticated needs of Web learners.

Research Activities: Past and Present

We are still very much in the nascent stage for creating Web learning environments. More needs to be learnt about designing successful online environments, technically, pedagogically and personally. Some of the studies pertaining learning show an inclination towards personalized learning. Reeves [1] advocated stronger, more reliable theoretical foundations in learning when he suggested, 'much of the research in the field of computer-based instruction is pseudoscience because it fails to live up to the theoretical, definitional, methodological, and/or analytic demands of the paradigm upon which it is based'. In contrast,conative and affective attributes of individuals are more stable over different online learning situations. Consequently, many Web learning designers are finding that conventional cognitive solutions are not enough. They are discovering the need to increase their focus on the conative and affective factors that influence learning. Any psychological decision is followed by a physical activity.

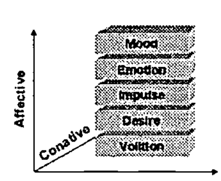

Figure 1: The information-processing model of cognition.

In a classroom, this can be observed when a student raises a spontaneous question or disagrees on a certain aspect. There is a vital relationship between key psychological factors (conative, affective, cognitive, and social), which influence learning differently. There is a constant attempt to identify the critical links between Web learning environments, learning differences and learning ability. The Web also supports learning methodologies that match individual learning differences. This form of learning system opens a new chapter in Web personalization. Cronbach [2] found that learning could be more effective when the adaptive principle is used. So in the fifties, he challenged the field to find 'for each individual the treatment to which he can most easily adapt'. He emphasized that we should design treatments, not to fit the average person, but to fit groups of students with particular aptitude patterns. In the late eighties, Snow [3] described how in cognitive psychology, conation as a learning factor has been 'demoted' and 'since it seems not really to be a separable function,' it is merged with affection. Snow was in search of an information-processing model of cognition that would include possible cognitive-conative-affective intersections. He was looking for a way to fit realistic aspects of mental life into instructional models. The information-processing model of cognition is illustrated in Figure 1. According to Snow [4], the best instruction involves treatments that differ in psychological structure and completeness and differential mental abilities. We should design treatments, not to fit the average person, but to fit groups of students with particular aptitude patterns. This is personalization or adaptive learning approach (called mass customization) that identifies aggregate types or segmented populations. Meanwhile, many contemporary researchers have extended their research on learning and memory constructs (and associated measures) to include conative, affective and social influences [5] [6] [7] [8] [9] [10]. Still, most have done so without recognizing and incorporating the dominant influence of conative, affective, and social factors. As a result, powerful psychological factors, such as intentions, personal desire, will, striving, motivation, efficacy, collaboration, pride, fear, frustration and satisfaction, are still being ignored or demoted to a secondary role. The cognitive-rich tradition remains the dominant consideration for learning. Web Technologists have to go further and build a system that recognizes psychological factors over a network. The task involves a study of Web users with varying psychological attributes and technology to bring such concepts to life. Digital gestures are one such attempt to realize some of the psychological factors based on the learner's mode of scanning. We should be aware that not all factors can be recognized. Psychological factors such as motivation and pride are not easy to grasp using simple digital gestures. A more complicated environment may be needed to apprehend those factors. Several research projects in the MIT Media Lab focus on Affective Computing.

Digital Gestures

Background

Every visit to a Web site generates important individual behavioral data, regardless of whether knowledge resources are used or not. Every individual's action is a digital gesture exhibiting habits, preferences, and tendencies [11][HREF2] . These interactions reveal important trends and patterns that can help a company design a Web site based on the analyzed results. Web Learning organizations can seize this opportunity to aggregate, enhance, and mine Web data to learn more about their students. Digital gestures work on the following principles:

(1)Information seeking mechanism on the Web based on modes of browsing and searching differentiated by information needs and information seeking activity.

(2)Operational methods for measuring information seeking on the Web by analyzing browser-based actions and events.

(3)Combinational use of multiple, complementary methods of collecting qualitative and quantitative data on how people seek and use Web-based information in their natural work settings.

Modes of Web Browsing Activities

Browsing

Directed browsing: This type of browsing occurs when browsing is systematic, focused, and directed by a specific object or target. Examples include scanning a list for a known item, and verifying information such as dates or other attributes.

Semi directed browsing: This occurs when browsing is predictive or generally purposeful. The target is less definite and browsing is less systematic. An example is entering a single, general term into a database and casually examining the retrieved records.

Undirected browsing: This occurs when there is no real goal and very little focus. Examples include flipping through a magazine and 'channel-surfing'.

Searching

Passive attention: This entails activities such as listening to the radio or watching television programs, where there may be no information-seeking intended, but where information acquisition may take place.

Passive search: It signifies those occasions when one type of search (or other behavior) results in the acquisition of information that happens to be relevant to the individual.

Active search: It is the type of search most commonly thought of in the information science literature, where an individual actively seeks out information.

Web activities	Desires+	Intentions*
Directed browsing	High level of eagerness	Short-term goal orientation
Semi directed browsing	Medium level of eagerness	Persistent, predictive
Undirected browsing	Little or no eagerness	Casual objective
Undirected viewing	Knowledge broadening	Coarse knowledge gain
Conditioned viewing	Targeted aims and objectives	Specialization
Informal search	Restrictive Knowledge attainment	Limited attempt
Formal search	Unbounded Knowledge attainment	Sincere attempt

+Desires attribute means the desire to attain an anticipated level of information
**Intentions attribute means the purpose of gaining specific information*

Table 1: Psychological Characteristics

Ongoing search: Where active searching has already established the basic framework of ideas, beliefs, values, or whatever, but where occasional continuing search is carried out to update or expand one's framework.

Viewing

Viewing can be used to describe a pattern of micro-moves of the individuals. The viewing classification is explained as follows:

Undirected viewing: In this type, the individual is exposed to information with no specific informational need in mind. The overall purpose is to scan broadly in order to detect signals of interest. Many and varied sources of information are used, and large amounts of information are screened. The granularity of information is coarse, but large chunks of information are quickly dropped from attention. The goal of broad scanning requires the use of a large number of different sources and different types of sources.

Conditioned viewing: Here the individual directs viewing to information about selected topics or to certain types of information. The overall purpose is to evaluate the significance of the information encountered in order to assess the general nature of the impact on the organization.

Informal search: During this search, the individual actively looks for information to deepen the knowledge and understanding of a specific issue. It is informal and involves a relatively limited and unstructured effort. The overall purpose is to gather information to elaborate an issue to determine the need for action by the organization.

Formal search: In this search type the individual makes a deliberate or planned effort to obtain specific information or types of information about a particular issue. Search is formal because it is structured according to some pre-established procedure or methodology. The granularity of information is fine, as search is relatively focused to find detailed information. The overall purpose is to systematically retrieve information relevant to an issue in order to provide a basis for developing a decision or course of action [12] [HREF3].

Browsing activities and Conative Attributes

Each Web activity inherits a relation with the psychological element of every individual. The conative attributes are more easily recognized as compared to the affective behavior. Later in this paper, we will confront an argument on how we can appreciate affective behavior in Web setting. Table 1discusses these psychological characteristics.

Web Data Acquisition

The usage data collected at the different sources represents the navigation patterns of different segments of the overall Web traffic, ranging from single-user, single-site browsing behavior to multi-user, multi-site access patterns.

Server Level Collection: A Web server log is an important source for performing Web Usage Mining because it explicitly records the browsing behavior of site visitors. The data recorded in server logs reflects the (possibly concurrent) access of a Web site by multiple users. These log files can be stored in various formats such as Common log or Extended log formats. Packet sniffing technology is an alternative method to collecting usage data through server logs. Packet sniffers monitor network traffic coming to a Web server and extract usage data directly from TCP/IP packets. The Web server can also store other kinds of usage information such as cookies and query data in separate logs. Cookies are tokens generated by the Web server for individual client browsers in order to automatically track the site visitors.

Client Level Collection: Client-side data collection can be implemented by using a remote agent (such as Java scripts or Java applets) or by modifying the source code of an existing browser (such as Mosaic or Mozilla) to enhance its data collection capabilities. The implementation of client-side data collection methods requires user cooperation, either in enabling the functionality of the Java scripts and Java applets, or to voluntarily use the modified browser. Client-side collection has an advantage over server-side collection because it ameliorates both the caching and session identification problems.

Proxy Level Collection: A Web proxy acts as an intermediate level of caching between client browsers and Web servers. Proxy caching can be used to reduce the loading time of a Web page experienced by users as well as the network traffic load at the server and client sides. The performance of proxy caches depends on their ability to predict future page requests correctly. Proxy traces may reveal the actual HTTP requests from multiple clients to multiple Web servers. This may serve as a data source for characterizing the browsing behavior of a group of anonymous users sharing a common proxy server.

Data Abstractions

The information provided by the data sources described above can all be used to construct/identify several data abstractions, notably users, server sessions, episodes, click-streams, and page views. In order to provide some consistency in the way these terms are defined, the W3C Web Characterization Activity (WCA) has published a draft of Web term definitions relevant to analyzing Web usage. A user is defined as a single individual that is accessing file from one or more Web servers through a browser. While this definition seems trivial, in practice it is very difficult to uniquely and repeatedly identify users.

Field Data type	Example
Time (Unix system format)	814679050
Machine name: process id	Dp: 485
User id	204
Window number	1
Event/action path	Menu/File/Open/URL
Same/new window	Same Window
Final action	Open URL
URL of page navigated to or URL modified	http://www.testfun.com/~games
Filename or email address	GI96/info.html
Title of page navigated to	Introduction to TestFun

Table 2: Log Entry fields with examples.

A user may access the Web through different machines, or use more than one agents on a single machine. A page view consists of every file that contributes to the display on a user's browser at one time. Page views are usually associated with a single user action (such as a mouse-click) and can consist of several files such as frames, graphics, and scripts. The aggregate page view is of importance when discussing and analyzing user behavior. A click-stream is a sequential series of page view requests. Again, the data available from the server side does not always provide enough information to reconstruct the full click-stream for a site. Any page view accessed through a client or proxy-level cache will not be visible from the server side. A user session is the click-stream of page views for a singe user across the entire Web. Typically, only the portion of each user session that is accessing a specific site can be used for analysis, since access information is not publicly available from the vast majority of Web servers. The set of page-views in a user session for a particular Web site is referred to as a server session (also commonly referred to as a visit). A set of server sessions is the necessary input for any Web Usage analysis or data mining tool [13]. Table 2 [14] is an example of log file and its field values.

User Sessions and Affective attributes

The frequency of events taking place during a user interaction is very significant for their behavioral analysis. The data evolved from these interactions are analyzed to determine the relationship between certain mental attribute and its corresponding response time. Some of the affective attributes like Excitement, Nervousness and Patience call for further investigation in this area.

Response time data

Both site response times and a user response time provide clues to many aspects of user attributes. Log files supply a source of observations of such response times. Slow site response can indicate an overly large file. If transfer of this file is commonly interrupted (recorded in the log file as an error), then you can ascertain that visitors are not patient enough to view the file. In contrast, a Web page that has a high average 'user response time' (viewing time) very likely has content of great interest. It could result into a digital expression of excitement or nervousness. A history list is maintained to keep a track of the recency and frequency of page visit. Illustrations of these activities are provided in Table 3.

Analysis Approach

Mean Times: Analyzing user response time data by calculating mean, or average times can create misleading results. Real observational response times include a small fraction of extremely long delays whose causes are not related to the usability of the site. For example, some users go to coffee or talk to their peers between one page reference and the next. This behavior inflates the mean time. The amount of inflation is highly variable simply due to random sampling effects. Together, the inflation and its extreme random variation-even in reasonably large total sets of observations-make mean response times less than reliable for measuring usability-related issues.

Median Times: A more effective approach to analyzing user response times is to use median times. The median is unaffected by the presence of a small fraction of large values. Measurements of medians are much less subject to variability than those of means.

Percentiles Values: In some circumstances, a percentile other than the median is preferable. For example, suppose you are interested in the behavior of regular users but you don't have user login data or cookie files for determining regular users. As an alternative, you can use the 10th percentile or some other percentile that is likely to represent the faster users, who are most likely to include those most familiar with the site. For example, we can consider a case of visit durations to a transactional Web page; the duration for the 10th percentile of visitors (40 visitors) who spent the least amount of time on the page can be calculated as 1.5 minutes [15].

Mass Customization

The above methods are used to aggregate data gathered from the Web site. The Web learners are characterized as individual subjects. The most important task is to group similar subjects together to achieve mass customization. Web learning organizations look for methodologies, which reduce their job of teaching learners on individual basis. This can accomplished using Pattern Discovery.

Pattern Discovery

Pattern discovery draws upon methods and algorithms developed from several fields such as statistics, data mining, machine learning and pattern recognition. Methods developed from other fields must take into consideration the different kinds of data abstractions and prior knowledge available for Web Mining. For example, in association rule discovery, the notion of a transaction for market-basket analysis does not take into consideration the order in which items are selected. However, in Web Usage Mining, a server session is an ordered sequence of pages requested by a user. Detailed discussion on any of the patterns discovery analysis is beyond the scope of this paper.

Statistical Analysis

Statistical techniques are the most common method to extract knowledge about visitors to a Web site. By analyzing the session file, one can perform different kinds of descriptive statistical analyses (frequency, mean, median, etc.) on variables such as page views, viewing time and length of a navigational path. Many Web traffic analysis tools produce a periodic report containing statistical information such as the most frequently accessed pages, average view time of a page or average length of a path through a site.

(a) A trace of the last 16 pages visited, and the user actions to get them. The top page (16) was just visited and the rest are in order of visit.

(b) Examples of history lists conditioned by different methods and numbers represent the URLs visited.

Visit no.	URL	Action
16	acsl.cs.uicu.edu/kaplan/applets	Open URL:
15	acsl.cs.uicu.edu/kaplan/work-environ	Open URL
14	acsl.cs.uicu.edu/kaplan/worlds	Open hotlist
13		Open URL
12		Open URL
11		Open URL
10		StartUp Doc.
9		Back
8		Back
7		Open URL
6		Open URL
5		Back
4		Back
3		Open URL
2		Open URL
1		StartUp Doc.

(a) Sequential ordering by recency 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1
(b) Recency, duplicates in latest position 16, 15, 14, 13, 12, 11, 10, 8, 7, 3
(c) Recency, duplicates in original position 16, 15, 14, 13, 12, 7, 6, 3, 2, 1
(d) Frequency, second key recency 10, 11, 8, 16, 15, 14, 13, 12, 7, 3
(e) Stack, sessional 16, 15, 14, 13, 12, 11, 10
(f) Stack, persistent 16, 15, 14, 13, 12, 11, 10, 1
(g) Context-sensitive Web 14 (16, 15)
10 (13, 12, 11, 8, 7, 3)
(h) Hyperlink sub-list sub-space (Session 1 only) 16 12 (13) 7
15 (16) 11 (12, 3) 3
14 (15) 10 (11, 6)
13 8 (7)

Table 3: Example of Digital Gesture

Association Rules

Association rule generation can be used to relate pages that are most often referenced together in a single server session. In the context of Web Usage Mining, association rules refer to sets of pages that are accessed together with a support value exceeding some specified threshold. These pages may not be directly connected to one another via hyperlinks. The association rules may also serve as a heuristic for prefetching documents in order to reduce user-perceived latency when loading a page from a remote site.

Classification

Classification is the task of mapping a data item into one of several predefined classes [16]. In the Web domain, one is interested in developing a profile of users belonging to a particular class or category. This requires extraction and selection of features that best describe the properties of a given class or category. Classification can be done by using supervised inductive learning algorithms such as decision tree classifiers, naive Bayesian classifiers, and k-nearest neighbor classifiers, Support Vector Machines etc.

Sequential Patterns

The technique of sequential pattern discovery attempts to find inter-session patterns such that the presence of a set of items is followed by another item in a time-ordered set of sessions or episodes. By using this approach, analysts can predict future visit patterns, which will be helpful in placing advertisements aimed at certain user groups. Other types of temporal analysis that can be performed on sequential patterns include trend analysis, change point detection, or similarity analysis.

Dependency Modeling

Dependency modeling is another useful pattern discovery task in Web Mining. Several probabilistic learning techniques can be employed to model the browsing behavior of users. Such techniques include Hidden Markov Models and Bayesian Belief Networks. Modeling of Web usage patterns will not only provide a theoretical framework for analyzing the behavior of users but is potentially useful for predicting future Web resource consumption [13].

Clustering

Our only source of information is Web log data that records users' document access behavior. We wish to use this information to construct clusters that represent closely related documents where the relevant information cannot be observed by simply examining the documents themselves. One requirement is that we must not predetermine the number of clusters and that we must use as little initial information as possible. In the Web Usage domain, there are two kinds of interesting clusters to be discovered: usage clusters and page clusters. Clustering of users tends to establish groups of users exhibiting similar browsing patterns. Such knowledge is especially useful for recognition of identical learners psychological state. One can use clustering techniques to impose an organizational structure on a collection of Web usage data by clustering together groups that are related or similar based on their content. The clustering induces the number and type of categories from the data. The organizational structure is data-driven and you don't have toprespecify document categories. Many clustering techniques produce flat organizational structures in which document groups are disjoint. Other clustering techniques produce hierarchical structures in which groups may be decomposed recursively into subgroups corresponding to refined categories. In any case, clustering turns unstructured document collections into organized groups that provide a summary view of the documents in that group. Figure 2 refers to the visualization of clustering. A short introduction to two of the vastly used clustering methods is given below:

K-means Clustering: K-means constructs a partition of a database of n objects into a set of k clusters where k is an input parameter. Each cluster is represented by the center of gravity of the cluster (k-means) or by one of the objects of the cluster located near its center and each object is assigned to the cluster with its representative closest to the considered object. Typically, this algorithm starts with an initial dense partition of database and then uses an iterative control strategy to optimize the clustering quality. However, K-means requires that the user provide the number K of clusters as initial input.

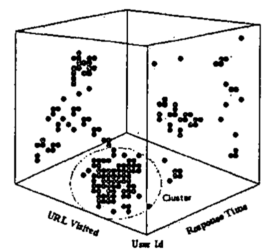

Figure 2: *Interactive 3-D environment for visualizing Clustering.*

Hierarchical Agglomerative Clustering (HAC): HAC creates a hierarchical decomposition of a database. The hierarchical decomposition is represented by a dendrogram, a tree that iteratively splits database into smaller subsets to consist only one object. In such a hierarchy, each level of the tree represents a clustering of database. It works as follows. Initially, each object is placed in a unique cluster. For each pair of clusters, some value of dissimilarity or distance is computed. In every step, the clusters with the minimum distance in the current clustering are merged until all points are contained in one cluster.

Future Work

This area of Web learning demands a lot of reckoning. Vast and in-depth empirical analysis is required for classification of conative and affective behavior. We also have to consider the possibility of multiple learners sharing a single sessions which makes this behavioral recognition perplexed. This understanding is meant for learners when online. In situations when learners are educated offline, we need to create an intelligent environment that identifies the digital gestures of the learners. We may be required to achieve a convergence between learner psychological behavior and their gestures. Drawing conclusions in a short period of time and in situations when few interactions are registered is one intricate job. There may be several instances, which may lead to a crossroad-like situation. A systematic classification mechanism is needed.

Conclusion

In this paper, we start with the argument about imparting personalized learning in WWW environment. We support this stand by the various research conclusions of past and present. The various activities prevalent in Web learning i.e., browsing, searching and viewing which help in deciding the psychological factors are elucidated. The vital correlation between Web activities and conative and affective attributes form the crux of the whole discussion. To finish, the mass customization aspect of Web learning is presented and can be attained using Pattern Discovery and Clustering.

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HREF1 http://abymale.tripod.com/

HREF2 http://www.db2mag.com/db_area/- /archives/1999/q4/

HREF3 http://firstmonday .org/issues/issue5_2/choo/index.html

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