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ABSTRACT

This paper provides an overview of the IT (Instructional Technology) Clinical graduate course at Virginia Tech and compares the perceived reality of the Clinical experience, in terms of benefits and concerns, with students' initial expectations. The paper begins with a discussion of the IT Clinical plan, the sociology of the learning environment (e.g., situated learning, community of practice, intrinsic motivation, and cooperation), methods for developing expertise (e.g., modeling, coaching, scaffolding, reflection, articulation, and exploration), content knowledge necessary for expertise, and sequencing of learning activities. Data collection is then described: open-ended questionnaires were used to gather data from students enrolled in a professional development seminar (n=27) about expectations of the Clinical experience; quantitative and qualitative data were gathered from students in two IT Clinical courses after fourteen weeks (n=10), representing the reality of the Clinical experience. Expectations and realities are examined related to peer interactions, faculty interactions, client interactions, task scope, personal/professional resources, professional development, and personal development. Responses to open-ended questions are discussed and illustrated with student comments around two general themes--client relations, and the benefits of the experience within the context of the characteristics of a cognitive apprenticeship learning environment. It is concluded that an environment conducive to apprenticeship learning was successfully established. (MES)

The Instructional Technology Clinical Experience: Expectations and Realities

By Katherine S. Cennamo & Glen Holmes

THE INSTRUCTIONAL TECHNOLOGY CLINICAL EXPERIENCE: EXPECTATIONS AND REALITIES

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"To learn to use tools as practitioners use them, a student, like an apprentice must enter that community and its culture. Thus in a significant way learning is, we believe, a process of enculturation." (Brown, Collins, & Duguid, 1989, p. 33)

Graduate schools in Instructional Technology (IT) typically prepare students with the tools of instructional design and development. IT programs usually require classes in instructional design, learning and instructional theories, and technical production skills. However, studies of expert performance indicate that experts in a domain possess more than knowledge of subject matter specific facts, concepts and procedures. Experts also posses heuristic strategies which include general techniques and "tricks of the trade", control strategies which direct the process of carrying out a task, and learning strategies that guide the expert in learning new concepts, facts, and procedures. Research in the development of expertise suggest that these additional skills may develop in situations that involve solving complex ill-defined problems under the guidance of a more capable other (Brown, et. al., 1989). Thus, the skills of an expert may be developed through immersion in the culture of practice. unfortunately, the only experience many graduate students have in the design and development of instructional materials is through small projects in courses; they may leave school with little experience in the design and development of complex projects for real clients, and with few opportunities for developing complex skills through enculturation.

Several methods have been suggested to involve graduate students more extensively in the entire design and development enterprise. Specific methods include; the preparation and examination of case studies; role playing and simulations; instructional design studios; class work on real projects; internships, apprenticeships, public presentations, competitions among graduate students; examination of design artifacts, and analysis of examples of expert work (Rowland, 1993; Rowland, Fixl, & Yung, 1992; Quinn, 1994; Tripp, 1994).

We developed the idea of an Instructional Technology "Clinical" to address the needs of our students for immersion in the practice of instructional design and development. We envisioned an experience based on an apprenticeship model of teaching and learning that included an instructional design studio experience (the "Clinic course"), public presentation of student work (as part of student evaluation), and the examination and development of case studies and design artifacts (as an orientation to projects and as part of student evaluation).

We explored the perceived need for a "Clinical experience" to facilitate learning through immersion in "real problems" that provide opportunities for participants to apply program ideas and techniques. During the fall 1997 semester, 27 students enrolled in our Instructional Technology Professional Seminar participated in a discussion of the Clinical concept. We followed the period of open discussion with a questionnaire asking students to identify the benefits of such an experience, their related concerns, and ideas for implementation. We developed a specific plan for an "IT Clinical" based on our examination of student's perceptions and review of literature. In this paper, we will provide an overview of the Clinical course and compare the perceived "reality" of the Clinical experience, in terms of benefits and concerns, with students' initial expectations of the Clinical experience.

The IT Clinical Plan

> *"Cognitive* apprenticeship methods *try to enculturate students into authentic practices through activity and social interaction in a way similar to that evident- and evidently successful- in craft apprenticeship. " (Brown, et. al., 1989, p. 37)*

Collins, Brown and Holum (1991) outline a framework for designing cognitive apprenticeship learning environments. Their framework suggests an appropriate *sociology* for effective cognitive apprenticeship learning environments, *methods* for developing expertise, types of *content* knowledge required for expertise, and how to *sequence* learning activities. Based on this model of cognitive apprenticeship, we have incorporated each of the proposed pedagogical features into the Clinical experience.

Sociology

The sociology of the learning environment includes the context and social environment in which the learning occurs. Collins, et. al. (1991) suggests that the learning environments should establish a social context where learning is situated, students participate in a community of practice, students are intrinsically motivated, and cooperation is encouraged.

Situated learning

Situated learning is defined as "learning knowledge and skills in contexts that reflect the way knowledge will be useful in real life" (Collins, 1991, p. 122). The purpose of the Clinical experience is to provide an experiential learning environment where students apply program ideas and techniques to develop instructional materials for the college, university community, and external organizations. Projects with actual clients with real instructional design problems provide opportunities to learn through immersion in the culture of practice.

Students enrolled in the IT Clinic are expected to spend considerable time on course activities on an ongoing basis. The course is offered for variable credit, and students are expected to spend approximately 3 hours per week working on the class for each hour of course credit. Specifically, students are expected to:

1. Contribute to an on-going design and development project.
2. Identify project and individual learning needs.
3. Meet project goals and individual learning needs in a timely manner.
4. Articulate design and development decisions.
5. Share expertise with other students.

In this way, the IT Clinical supports and facilitates situated learning.

Community of practice

In a community of practice, participants are expected to relate to one another with respect, participate in and take responsibility for the collective life of the project, and count on one another for meeting both individual and collective needs. In the Clinical, students further along in the program are expected to collaborate with beginning students and mentor them along with faculty. Individuals are "free to specialize in particular areas so that the community can capitalize on diversity" (Lin, et. al., 1995). Clinical students assume one or more possible roles, depending on the project. In this way, students learn about the design and development process by observing how others approach a problem.

Intrinsic motivation

Intrinsic motivation is encouraged as students set personal goals to perform specific activities and gain particular skills. Students' progress is assessed through an informal system in which students determine activities they will pursue to meet those goals and document their process. As faculty, we evaluate the reasonableness of those goals and the extent to which students are successful in meeting them.

Cooperation

Students work together to accomplish common goals. Each participating student and faculty member evaluates the degree to which their peers contributed to the project and shared their expertise with others. The willingness of participants to share their expertise through coaching and modeling techniques is considered in these evaluations.

Methods

Methods for developing expertise include modeling, coaching, scaffolding, articulation, reflection, and exploration. These methods are clustered into three groups of complementary activities (Collins, et. al., 1991). *Modeling, coaching,* and *scaffolding* by the teacher or more competent peer provide learners with guidance and support as they gain new skills through progressively more complex or independent activities. *Articulation* and *reflection* by both the teachers and students make reasoning explicit and allows learners to compare their developing understanding with the ideas of others. *Exploration* provides opportunities for learners to define their own goal problems and seek ways of solving them independently. We have incorporated each of these features in our Clinical experience.

Modeling, coaching, and scaffolding

Modeling refers to the demonstration of processes and strategies to perform real-world tasks by the expert. In a cognitive apprenticeship, many problem solving tasks take place mentally; thus, it is important for the experts to provide detailed explanations of what they are doing and why. Modeling introduces learners to the processes and strategies used to solve a complex problem; coaching supports students as they attempt a task on their own. Coaching involves providing hints, feedback, giving encouragement, and otherwise overseeing the learning process (Collins, et. al., 1991). Scaffolding refers to the process of providing, and gradually removing, support for learners, as they become increasingly more capable of performing tasks independently. Support can range from doing almost the entire task for the learners to giving occasional hints as to what to do next. Taken together, modeling, coaching, and scaffolding provide the foundation for cognitive apprenticeship (Collins, et. al., 1991)

Our Clinical students and faculty meet once a week to discuss project progress and plan the next steps. Some meetings involve the client as well as the project team. During these meetings, we scaffold student learning. Students are encouraged to perform as much of the task as possible independently. We constantly assess the students performance, and when their performance is judged to be going astray or students appear to be floundering, we coach them through offering suggestions, providing hints, or asking guiding questions. If they still appear to be going astray in their reasoning or performance, we step in and model the way we would handle the situation.

These weekly design meetings provide opportunities for faculty to diagnose areas where the students are having problems. A variety of "just in time" instruction is provided to demonstrate skills needed by the design and development team beyond those possessed by the group members. Periodic "workshops" are scheduled throughout the term to respond to the learning needs of a particular semester. Faculty as needed, to respond to the information needs of the task at hand selects Reading materials. Students are encouraged to learn from others as much as possible. In fact, students are expected to model behaviors for their peers, coach others in obtaining new skills, and provide scaffolding for their peers.

Reflection and Articulation

Articulation refers to the process of verbalizing thoughts and reasoning in order to make design decisions explicit. Through reflection, individuals compare their ideas and skills with those of others. These methods encourage both students and faculty to think about what they are doing and to make their tacit knowledge explicit. "By engaging students and faculty in dialogues regarding the identification of problems and causal relationships, as well as requiring justification from participants regarding their use of certain strategies, cognitive apprenticeships are thought to encourage reflective thinking. Reflection is believed to help students learn how to think about their work and the work of others in order to understand it, to learn from it, and eventually to contribute to new conceptions of it " (Ertmer & Cennamo, 1995, p. 48).

During weekly Clinical meetings, faculty and students reflect on and articulate their design decisions. As a means of assessing student learning, students are expected to prepare design documents (a "case") based on their project. Through the preparation of design artifacts and cases, students are required to reflect on their current understanding of the issues of the project and identify what they have learned by participation in the Clinical experience. In addition, students who join the project in subsequent semesters are able to examine the materials in order to identify the current status of the design project. As such, the cases provide an orientation to the project for students who enroll in the Clinical in subsequent semesters.

In addition, each project team is expected to publicly present their project in forums such as our Instructional Technology Professional Seminar, presentations to client groups, and conference presentations. These presentations provide students with opportunities to reflect on their decisions and articulate their reasoning in order to justify the design decisions that contributed to their finished product.

Exploration

" Exploration, as a method of teaching, involves setting general goals for students and then encouraging them to focus on particular subgoals of interest to them or even to revise the general goal as they come upon something more interesting". (Collins, et. al., 1991, p. 44) Each week, Clinical participants identify specific tasks to be completed before the next class meeting. The task assigned to each student is based on a combination of the students' individual strengths as well as their interest in learning more about unfamiliar areas of instructional design and/or development. Students are responsible for identifying tasks of interest to them and setting sub-goals to accomplish those tasks. Depending on the nature of the task, students may work individually, in pairs, or as a group of the whole. Students generally understand, and are willing to accept their responsibilities in completing an assigned task

Content

Content knowledge necessary for expertise includes domain knowledge, heuristic knowledge, control strategies, and learning strategies. Although students are expected to enter our course with domain knowledge in the areas of instructional design, learning and instructional theories, and technical production skills, we anticipate that their heuristic strategies and control strategies may be relatively undeveloped. However, as the students have at least a bachelors degree before enrolling in the course, we assume they posses adequate knowledge of learning strategies; thus are able to direct and monitor their own learning. Collins, et. al (1991) acknowledge that heuristic knowledge and control strategies may be learned through observation of experts articulating their decisions, making their reasoning explicit, and reflecting on what they did and why. In our Clinical classes, faculty and students work together to solve instructional problems. The composition of the classes reflect a variety of expertise in instructional design and development, ranging from instructors with fifteen or more years of experience in the field, to beginning masters students in instructional technology. As we collaborate as a design and development team, we try to develop heuristic knowledge and control strategies through the sociology and methods of a cognitive apprenticeship.

Sequencing

Collins, Brown and Holum (1991) also suggest that learning activities should proceed in a certain order. Global activities that provide opportunities to understand the whole task should precede the development of specific skills. Task should increase in complexity and difficulty, and finally, activities should reflect increasing diversity as students develop their expertise in order to emphasize the broad application of skills across a variety of situations. Although this sequencing of skill development is not apparent within a semester-long Clinical course, students are encouraged to enroll in the Clinical experience for multiple semesters. Likewise, students are encouraged to enroll in the Clinical at multiple points in their academic experience. In this way, beginning students may develop a global understanding of the entire design and development experience as they participate in less complex tasks on the development team. As they increase their expertise, they are expected to assume increasingly complex responsibilities. As they participate in the course across multiple semesters, participating in multiple projects, they gain practice in applying skills across a variety of situations, with a variety of projects and clients.

Procedures

We piloted our Clinical idea with a group of 5 students during the spring 1998 semester. During this pilot semester, we tested and refined our preliminary ideas. During the fall 1998 semester, 11 students enrolled in two courses offering a Clinical experience. The intent of this paper is to compare students expectations of the Clinical experience with students perceptions of the actual experience (the reality). The data for this comparison was collected at two points in time.

Data Collection

Expectations

Data reflecting initial expectations of the Clinical experience was collected from 27 students enrolled in our Professional Development seminar during the fall 1997 semester. Although no demographic data was collected from these participants, the Professional Development seminar is intended for doctoral students. During any semester, typically no more than 5 of the approximately 30 students are master students. Following an open discussion of the Clinical concept of approximately 30 minutes in length, students completed an open-ended questionnaire which asked students to identify the benefits of such an experience, their related concerns, and ideas for implementation. We believed that this advanced group of students would be in an ideal position to reflect upon the potential benefits and problems of a Clinical experience. This data reflects students' expectations of the Clinical experience.

Reality

During the fall of 1998, the two Clinical courses enrolled six master students and four doctoral students majoring in Instructional Technology. One doctoral student from another academic area was enrolled in the course. As this student did not meet the characteristics of the target population of the Clinical, his responses were eliminated from the final analysis.

Different professors taught the two classes and each class worked on a different project. However, both projects were complex in nature. The students in one course were asked to create an online system to support scientific inquiry using museum objects. This task involved providing electronic access to the museum collection and developing an electronic support system for inquiry-based learning. Led by another instructor, students in the second class formed a single group that provided services for a small liberal arts university in North Carolina. This student group was charged with the responsibility of providing "electronic" solutions to instructional problems identified by the university's faculty and staff.

However, the intent of this paper is *not* to discuss the details of the individual projects but to discuss students' perceptions of the Clinical experience to determine commonalties between the two experiences. In the fall 1998 semester, we collected quantitative and qualitative data on the perceptions of students who were enrolled in the Clinical courses. At the time at which the data was collected, these students had participated in the Clinical experience for fourteen weeks. This data represents the reality of the Clinical experience. Students were asked to rate the degree to which they agreed or disagreed with 25 statements derived from a list of possible benefits and concerns generated by IT Professional Seminar students in response to the idea of having Instructional Technology students work on "real life" projects within a course setting. They rated their responses on a five- point scale that included "strongly agree", "agree", "don't know", "disagree" and "strongly disagree". Statements were similar to the following:

- I liked being part of a team working toward a common goal.
- I benefited from interacting with clients outside of IT.
- I felt that the faculty treated me like a colleague.

In addition, students responded to three open ended questions, which asked them to reflect on the situation, their own learning, and the Clinical experience. They submitted written responses to the following three questions:

1. Assessment of situation (For example: What have you observed when working on this project? What seemed to work well? What not so well? What would you have liked to go differently? What suggestions would you have for others who wanted to do similar projects?)
2. Self- assessment (For example: What have you learned? What were the benefits to you? Anything you wish you had done differently? What caused you frustration?)
3. Assessment of course/ Clinical (For example: What were the benefits of the way it was conducted? What caused you frustration? What suggestions would you have for others who wanted to conduct other instructional design and development Clinical courses?)

Results and Discussion

Expectations

Students' expectations were analyzed to determine trends and patterns in their responses. Perceived benefits included opportunities for peer, faculty, and client interactions; professional and personal development; opportunities to apply what they learned in their course work, and available resources. They were concerned about the nature of peer, faculty, and client interactions, scheduling the Clinical within the current curriculum, the scope of the task, and having enough resources.

Peer Interactions

Students perceived increased interactions with their peers to be a benefit of the Clinical experience. They indicated that they would benefit from interaction with other students on real projects and by being a part of a team working toward common goals. On the other hand, they were concerned about trust among group members.

Faculty Interactions

They viewed interactions with faculty members as both a benefit and possible concern. They perceived that mentoring and modeling of behaviors by faculty members would be beneficial; however, they were concerned that they may not get the mentoring they needed. They realized that increased interactions with IT faculty could be beneficial, yet, they were concerned that faculty may not be actively involved. They felt it would be beneficial to be treated like a colleague by the faculty, yet were concerned that they may not be.

Client Interactions

Students also viewed client interactions as beneficial and of possible concern. They thought it would be beneficial to work with different people in different settings. However, they were concerned that they may not have the opportunity to be a decision-maker.

Task Scope

They also were concerned about their roles and responsibilities. They were concerned that the projects may require them to provide technical support only, and hoped to have the opportunity to serve as instructional designers as well as developers. In addition, they were concerned that the task may be too broad or too simple.

Personal and Professional Resources

On a related note, they were concerned that the course many require more hours of work than a traditional course. They also were concerned that they may "get in over their head" in terms of technical skills. They recognized that "just in time" training was a benefit of the Clinical experiences, but were concerned that training may not be provided as needed or that they would not be given the time to learn new skills when needed. They felt that access to on-campus resources might be a benefit, yet were concerned that they may need resources that were not available.

Professional Development

However, they saw several benefits in terms of professional development. They perceived that the real world experience would provide an opportunity to apply program ideals and techniques. They saw the "hands-on" nature of the course as extremely practical. Students recognized that they would benefit from the multiple perspectives of the Clinical participants. They believed the Clinical experience would make them more marketable, provide satisfaction for the work done, and document their skills and competencies.

Personal Development

They also looked at the Clinical experience as an opportunity to determine their individual strengths and limitations. They believed they would learn to delegate responsibilities and accept delegated responsibilities. Students also thought they would learn to respect colleagues' capabilities and communicate with them about specific goals.

The Reality

Survey Results

Responses to the survey items were tabulated and percentages of students selecting each response option were calculated. For most of the survey questions, there were no noticeable differences in responses between the two Clinical courses. Where there were differences, these differences are noted. Responses are discussed in relation to students' initial expectations in each category of perceived benefits and concerns.

Peer Interactions

Ninety percent of the students felt they benefited from their interactions with other graduate students. All students agreed that they felt like part of a team. Ninety percent of the students liked being part of a team working toward a common goal. In addition, 80% felt they learned skills from other graduate students in the group. The perceptions of students who had completed the Clinical experience seemed consistent with students' expectations of the benefits of peer interactions.

Faculty Interactions

All students enjoyed working closely with IT faculty and believed that the faculty was actively involved in the project. Seventy percent of the students felt the faculty treated them like colleagues. The other 30% did not know. Ninety percent of the students felt they benefited from the mentoring and modeling of behaviors by faculty.

Students' perceptions of faculty interactions were consistent with expected benefits of the experience. Students initially expressed concern that the faculty may not be actively involved in the project, they may not provide mentoring as needed, and that they may not treat students like colleagues. The responses of students who participated in the Clinical experience indicates these concerns were unfounded.

Client Interaction

Students felt they benefited from interacting with clients outside of the field of Instructional Technology. Eighty percent of the students agreed that they learned to communicate with clients about specific goals. However, two students from one class disagreed with this statement. Students expected client interactions to be both a benefit and a concern; from the responses to the questionnaire, client interactions seem to be perceived as providing more benefits than limitations

Personal and Professional Resources

Students initially had many concerns related to personal and professional resources. They were concerned that the course many require more hours of work than a traditional course, that they may get in "over their head" in terms of technical skills, that training may not be provided as needed, and that they would not be given the time to learn new skills. In addition, they were concerned that they may not have access to the necessary resources. Student's responses to the survey indicated that these concerns were unfounded.

Seventy percent of the students felt they received training and instruction as needed. In one of the classes, one student did not know if training and instruction was provided as needed, and two students believed it was not provided as needed. However, all students felt they were given the time to learn skills needed on the projects; and only one student felt "over my head" in terms of technology. Eighty percent agreed that they were provided with adequate resources to complete the project, one student disagreed, and one didn't know. Seventy percent of the students felt the time demands of this course were no greater than for a traditional course; half of the students in one of the classes (30% of respondents) felt the time demands of this course were greater than in traditional courses.

Students were split in their feelings toward ending their involvement after one semester. Thirty percent were comfortable, 40% didn't know, and 30% were not comfortable ending their involvement.

Professional Development

Ninety percent of the students felt the class was extremely practical. All students agreed that they benefited from the different perspectives of the group members, faculty and clients. Ninety percent of the students agreed that they had the opportunity to apply what they learned in other classes. The survey responses confirm students' initial perceptions of the professional development benefits of the Clinical experience.

Personal Development

Ninety percent of the students felt they learned to trust their colleagues. Seventy percent of the students felt they learned to delegate responsibilities. However, two students in one class ***did not agree*** that they learned to delegate responsibilities. From their responses, we do not know whether they already knew how to delegate responsibilities or whether they lack the skill and simply did not learn it. However, 90% agreed that they learned to accept delegated responsibilities. All students agreed that they learned to communicate with colleagues about specific goals. Ninety percent agreed that they learned to recognize others skills and capabilities. Seventy percent of

the students agreed that they became aware of their own lack of abilities, one student didn't know, one disagreed with the statement, and one did not respond. From the responses to the questionnaire, it appears that the expected personal development opportunities were present.

Results of Open-ended Questions

The responses to the open-ended questions were analyzed to look for general patterns and themes across individuals. Although different professors taught the classes, students worked on different projects, and course activities differed slightly, analysis of the qualitative data indicated no differences in students' perceptions of the two experiences.

Student comments clustered into two main themes: Students primarily commented on the frustrations of working with a client and the benefits of the experience. In the discussion below, general themes are illustrated with student comments.

Client Relations

Even though the two courses worked on different projects with different client contacts, the majority of comments on the open-ended questions referred to client relations. Students commented on their difficulties in obtaining information from clients as quickly as they would like.

- "The experiences were trying at times. Clients have their own sense of time and time frame."
- "Communications with the client were difficult and frustrating. I learned patience."
- "Timing was the only frustration. Having to depend on someone you don't even know for information is difficult to handle."

Students were clearly frustrated with the difficulty of communicating with clients about their goals, expected products and vision.

- "I think the client caused the most frustration. I never got from our liaisons, what they wanted, nor did I really understand the view they were coming from."
- "In hindsight, it appears that there was little shared understanding of the issues we were trying to grasp, and there was a long drawn out period where these were slowly teased to the surface."
- "It would have been helpful to know specifically what the client wanted without having to go through some type of discovery process. However, this would be counter to the "real world" nature of the course."

Students wanted to share what they learned about communicating with clients with others. Advice and suggestions for future Clinical groups often centered on client relations.

- "I would suggest to others to, first keep it professional, don't just listen to the client, hear them, and hear what they are not saying, and don't get frustrated, it is all part of the process."
- "... do everything within your power to coerce a vision out of your client before proceeding, even if it means extra time up front."
- "Make sure that everyone's role is clearly articulated and agreed upon before proceeding. ... even though it seems overly formal at first, it can avoid problems further down the road."
- "Advice for such situations in the future: make sure all project participants are clear on what the goals and products of such a partnership will be."

Some students who did not interact with the client directly were frustrated by this lack of interaction.

- "I have enjoyed being in the Clinical. I do wish I had been more a part of the client process. I feel a lot of that interaction was done by others and at times I felt on the outside of what ever was going on. All did a great job of reporting, but it is hard to read faces and gestures from others reports."
- "I wished that I had more interaction with the group. I know that we met once a week, which was beneficial, but I feel like I was left out of some of the conversations that went on."

Benefits

However, students enjoyed the experience and felt they benefited from participating. Their positive comments reflect our success in developing a supportive apprenticeship environment. Students' perceptions will be discussed as they pertain to the characteristics of a cognitive apprenticeship learning environment.

Situated Learning

Students felt their learning was situated in a realistic context where they could learn skills in the context of their application.

- "For me this course was real world. The task was handed down, assignments were made, and I was responsible for doing my part. There was a team of people, including the client, depending on my participation. It forced me not to procrastinate and actively take a role in the goals and objectives of the program. I would gladly take more classes like this, than hand holding and "this is what could happen" kind of classes. I enjoyed the experience of it all."
- "I feel very good about watching and participating in the "real process" of designing. I think this experience has probably

- taught me more than if we had had a smooth liner process. If our project had gone according to the books, the learning curve for me would have been much lower."

Community of Practice

Students' responses to the open-ended reflections indicated that they felt they were part of a community of practice, where each team member was working toward common goals. Students commented:

- "The benefits of the Clinical in the way it was conducted was the "real" environment that was created. It was a work group coming together and delegating task to one another. It was each of us working separately toward a common goal and needing the work of others to be able to fit our part into the puzzle."
- "I appreciate all the learning I did from everyone. Each of the participants brought their own platter to the table and I feel very appreciative that I was able to glean some knowledge from everyone."

Intrinsic motivation

As the students' comments indicated, they felt satisfaction from achieving their goals. These responses indicate that the Clinical successfully created a social climate that encouraged intrinsic motivation.

- "It is an exceptional experience to see work done for class to have an immediate impact on a client or institution other than doing the work for a grade or to fulfill a requirement."
- "This class was a great benefit to me. I learned what it takes to be a team to achieve a common goal. What I really liked about this class was that it pertained to a "real" situation. It felt good once the goal was achieved."

Collaboration

Students also felt they worked in a collaborative environment, where they were part of a team.

- "That was the best thing about the experience... for everything that we needed to get done there was one of us that could do it without much difficulty."
- "I also learned the importance of doing what you do well whenever you can. It made it a lot easier to get the easy stuff done, let other people get their easy stuff done, and hopefully, there will be nothing left."

Students also recognized the value of the methods of instruction. They commented on the benefits of the *coaching, modeling, and scaffolding* that occurred.

- "The Clinical experience was good.... I really grew from the mentoring and discussions."
- "I learned a great deal from all of the people in the group. Working with others has given me a better understanding of the process and what to do and what not to do."

Student responses indicated active articulation and reflection on their skill development.

- "The benefits to me were the group interaction and being responsible not only for myself but also for a team of people, the interaction with the client and feeling like my skills were 'up there' and 'comparable to others'."

And finally, they rose to the challenge inherent in the exploration phase of a cognitive apprenticeship.

- "I had to learn new skills as I applied them. I would have preferred to have the skill going into the class. However, this is often the reality of the work place."

Conclusions

The results of our investigation indicate that we successfully established an environment conducive to apprenticeship learning in our Instructional Technology Clinical courses. We compared students' expectations of the Clinical experience in terms of perceived benefits and concerns with students perceptions of the reality. The results indicated that the expected benefits from faculty and peer interactions, realistic experiences, client interactions, personal and professional development opportunities, and applied learning were achieved. In addition, the results indicated that students' concerns about inadequate training and mentoring by faculty, increased time demands above those of traditional courses, lack of trust among team members, and inadequate resources were unjustified. Analysis of students' reflections on the Clinical courses indicates that students perceived the sociology and methods of cognitive apprenticeships as beneficial to the Clinical experience. Their responses mentioned the beneficial effects of modeling, coaching, scaffolding, reflection, articulation, exploration, situated learning, cooperation, intrinsic motivation, and a community of practice.

However, Clinical students expressed frustrations at the nature of their interactions with clients. It must be noted that from our perspective as faculty members with extensive experience in design and development, our interactions with the clients were not atypical. In many ways, the students' concerns were justified: their concerns were the result of the situated nature of their learning. They were frustrated as they tried to apply skills in client interactions; skills that are not addressed by typical coursework in instructional technology, but are best developed through experience and immersion in the culture of practice. The prevalence of student comments on client relations emphasizes the need for experiential learning experiences in instructional technology graduate programs. By participating in real experiences with real clients prior to graduation, students can be mentored and discuss possible strategies with colleagues in a safe learning environment.

The results of these analyses suggest that we may need to prepare both clients and students for the collaborative experiences. Both clients and students need to realize that the client's environment and university classes represent different cultures, each with their own set of expectations, vocabulary, timelines, rewards, and consequences. As faculty coordinators, we should assess students' experience in interacting with clients to design and develop instructional materials and conversely, clients' experience in working with instructional designers and developers. Guidance can be provided to both clients and students in the form of readings, direct modeling, coaching behaviors, and discussions concerning issues of collaborating on a common project.

Despite occasional frustrations by students, both groups gained from their collaboration. The students working with the university in North Carolina successfully accomplished the following tasks:

- wrote and submitted a grant to request funding for the establishment and operation of an instructional systems development research group.
- designed and developed an on-line database to assist the university in procurement, security, and maintenance of instructional technology facilities and equipment
- negotiated an agreement to enroll participants of the university's cohort initiative into a nationally acclaimed professional development academy;
- reviewed and reported on a variety of software tools used to develop and deliver Web-based instruction
- arranged for the cohort's graphic-design work to be sub-contracted to an external group comprised of work-study students majoring in graphic arts.

Students working with the museum successfully:

- reviewed literature on inquiry based learning
- reviewed numerous museum web sites to identify those that included elements of inquiry based learning
- developed a plan for a museum web site that provided access to collection information for the purposes of conducting inquiry
- developed a prototype web site that included collection images and data, inquiry based lesson plans, and background information on scientific inquiry.

We envision this Clinical in product design and development as the first of several such experiences. Our graduates, like our faculty, often have responsibility for design and development of instructional materials, for the creation and publication of original research, and for teaching. Apprenticeship learning experiences can be developed in both research and teaching based on this model.

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