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The International Journal of Instructional Technology and Distance Learning is refereed, global in scope, and focused on research and innovation in teaching and learning.

The Journal was established to facilitate collaboration and communication among researchers, innovators, practitioners, and administrators of education and training programs involving instructional technologies and distance learning. The editors and peer reviewers are committed to publish significant writings of high academic stature.

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Donald G. Perrin
Executive Editor

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Editorial

Technology

Donald G. Perrin

When Marshall McLuhan introduced the concept of machines as “extensions of man” he elicited images of levers and mechanical extensions of our ability to do work. Few of us anticipated the expanded intellectual capabilities resulting from computers and information processing that led us into the information age. And only visionaries could anticipate that this technology would be available to everyone at a very low cost.

The computer is the universal tool. It can be a simulator, game machine, automated manufacturing device; or number cruncher. It can handle text, graphics, numbers, languages, and logic of increasing complexity. It can match and interpret graphics as individual as finger prints. It can read handwriting, turn voice into text, convert foreign languages into English, correct grammar and spelling, and perform complex mathematical equations in seconds that previously required years or decades. The computer is not the same as human intelligence, but it extends it with processing at the speed of light and the ability to search, store, integrate, access, analyse, interpret, and disseminate all kinds of information.

In the history of technology, computers information systems have had a more profound effect on teaching and learning than anything since movable type and the industrial revolution. Technology can expand in two directions – mass communications, like films and television, and individual communications, as with telephone. At first, educational technologies were concerned with economy of scale so that film and broadcast media predominated. In the 1950s the transition to individualized media began to impact education – language labs, teaching machines and mainframe computers.

Personal computers revolutionized business and education in the final quarter of the century. Astounding improvement in the power-to-cost ratio and rapid growth of broadband networks set the stage for and unprecedented revolution in teaching and learning that has impacted both education and training. By the mid 1990s it was apparent that, during the next decade, not enough brick and mortar universities could be built to house the growing number of students, professors, and courses. This paved the way for explosive growth of online learning and virtual universities. Research in distance learning was focused on eLearning to meet the challenges of the new millennium.

Industry demonstrated tremendous financial savings from distance learning. Education gained its greatest benefit as a way to provide quality courses and programs to unserved and underserved populations.

This issue of the Journal focuses on turning theory into practice and research to optimize learning.

Editor's Note: Threaded discussions are one of the principal dynamic tools used in eLearning. This exploratory study uses tools for formative evaluation and analysis to examine theoretical constructs and mechanisms to enhance design, application, evaluation and optimization of threaded discussions for library science students. Some findings, such assigning a moderator or using subject lines as advance organizers, have immediate value for all disciplines. Other findings require additional research to determine applicability for other subject matter and learner populations.

Mapping MLIS Asynchronous Discussions

Barbara A. Frey, Millie S. Sass, Susan W. Alman

Abstract

Asynchronous discussions offer a convenient, flexible communication forum to actively engage students and enhance learning. This paper describes a formative assessment process of mapping discussions to analyze group interaction and critical thinking skills in a graduate level Library and Information Science course. Discussions of various depth, breadth, and complexity were mapped, beginning with the initial or parent posting and branching to include all student responses within a thread. Postings were analyzed with a content analysis tool to identify statements according to the level of cognitive skill, questions, reflections, and affirmations. In general, open-ended questions solicited contributions at higher cognitive levels. The deepness of ongoing responses in a discussion did not necessarily lead to higher levels of thinking. Recommendations include training students to manage discussion threads they begin, to write clear, concise contributions, and to use subject lines as advanced organizers for each posting or reply. In addition, facilitators should establish clear expectations, summarize forums, and model effective online communication strategies.

Keywords: asynchronous, discussion, online, distance education, bloom's taxonomy, content analysis, formative assessment, formative evaluation, critical thinking

Introduction

Many Web-based courses rely on asynchronous discussions as a form of computer mediated communication to enhance learning. Online asynchronous discussions support high levels of thinking and interaction in a convenient, flexible environment (Berge, 2002; DeArment, 2002). Instructors often structure their distance education courses into weekly lessons or modules and discuss the course concepts in the discussion forums. Weekly discussions may include responses to instructor questions, case studies, guest speakers, debates, or Web sites. There are learning benefits when students actively engage in online discussions. In postings, students have the opportunity to reflect on their understanding of the course content and develop substantive comments that contribute to the community learning environment (Allan, 2004; Flynn & Polin, 2003; Tu and Cory, 2003). Many instructors report that online discussions benefit shy or international students especially by allowing them time to clarify and develop their remarks (Chickering & Ehrman, 1996; Warschauer, 1996). However, "simply requiring students to post messages to address the instructor's questions may not result in effective learning" (Tu & Corry, 2003, p. 304). Effective discussions require thoughtful design, facilitation, and assessment. A detailed analysis of course discussions can help faculty to identify best practice strategies and refine areas that need improvement.

Purpose

The purpose of this study was to analyze group interaction and higher order thinking in online asynchronous discussions in a graduate level Library and Information Science course. The study population was comprised of all students who contributed to the threads made available to us by the course instructor. The threads that we selected for analyses were triggered from open-ended, discussion-type questions; they were not of the type that required explicit response or submission of assignments. For purposes of this study we used the terms *higher order thinking* and *critical thinking* interchangeably. In general, higher order thinking skills can be defined as the top four levels of Bloom's Taxonomy (1956).

Specific discussions were analyzed with maps that provided a visual diagram to show the depth and breadth of the online discussion threads. Each map began with the assignment (or the "parent" posting that initiated the discussion) and linked the network of postings. Maps allowed both the instructor and students to see the richness of the discussions through the number of postings linked to each comment or question. For our study, we reviewed discussion threads for the assignments or questions that began the dialogue, and the levels of thinking according to Bloom's Taxonomy (Bloom, 1956). The course instructor began this analysis as a "snapshot" or formative assessment to review the effectiveness of her asynchronous discussions; however, the analysis model and recommendations may be of interest to other faculty.

In particular, our goal was to respond to the following questions:

- Do higher levels of cognitive skill emerge in deeper, broader, or more complex threads?
- What changes in contributors' actions will make a thread easier to follow and will contribute to critical thinking?

We used the mapping approach to begin our quest in the analysis of discussion threads. To map a thread or portion of a thread, we converted a text list (Subject Lines) into a flow chart showing the relationship between initiator and reply postings. It is a labor intensive approach; we do not suggest that it should be used for every analysis and case, but it met our needs of formative assessment. Note that our purpose was to investigate contributions to discussion threads; we focused on threads triggered by open-ended questions, but our purpose was not to delve into the deep and complex genre of question construction.

Literature Review

The benefits of online asynchronous discussions are well documented in the literature. Web-based discussions are convenient because they are not time or place dependent. Not only can students respond at their own pace, they all have an equal opportunity to express themselves (Palloff and Pratt, 2002; Peters, 2000). Discussion boards provide a permanent record (Meyer, 2004; Clouse, 2003) of interaction that is easy to archive and search. In addition, asynchronous discussions are collaborative, which allows for a social construction of knowledge (DeArment, 2003; Thomas, 1999). Positive learning outcomes are also attributed to the thoughtful reflection required in composition of postings (Allan, 2004; Flynn & Polin, 2003; Tu and Corry, 2003). Writing-to-learn literature describes writing as a way to reflect, analyze, and communicate important ideas and concepts to others. Elbow (1994) wrote, "Students understand and retain course material much better when they write copiously about it" (p. 4).

Student reflection is prompted by questions that serve one of two functions—they are either centering (questions that promote convergent thought) or expanding (questions that promote divergent thought) (Hunkins, 1972). In an asynchronous learning environment, Blanchette (2001) found that questions at higher levels exhibited higher cognitive levels and more interaction among learners than those at lower levels. Muilenburg and Berge (2002) agreed and wrote, "The

level of student thinking is directly proportional to the level of questions asked" (n.p.). The following six levels of Bloom's Taxonomy (Bloom, 1956) are commonly used to categorize discussion questions from lower to higher cognitive skills: (1) knowledge, (2) comprehension, (3) application, (4) analysis, (5) synthesis, and (6) evaluation. The later categories represent higher levels of thinking (Davis, 1993; Hyman, 1979).

The benefits of online discussions have led several researchers to further explore student interaction and develop models and tools for online discussion analysis. There are several types of analysis, including frequency of postings and content analysis. Content analysis studies have been qualitative and explore issues such as problem solving or critical thinking (Rourke and Anderson, 2004; Meyer, 2004; Garrison et al., 2001; Angeli, Bonk, and Hara, 1998). Quantitative studies focus on measures such as frequency of postings, which may include the number of threads per forum, the number of postings per thread, or the number of instructor postings per thread (Mazzolini and Maddison, 2003; Monroe, 2003; Bullen, 1998; Ahern, Peck and Laycock, 1992). Allan (2004) noted the need for an analysis tool that reviewed the process of knowledge development as a whole. This paper includes a description of three content analysis models which were synthesized to create the instrument used in our analysis.

In 2001, Archers et al. analyzed critical thinking or cognitive presence in online discussions in higher education courses. They explained that "cognitive presence is grounded in literature on critical thinking" (n.p.) and is defined as the extent to which learners are able to construct and confirm meaning through reflection and discourse. The following four phases were used to analyze each discussion posting: (1) triggering event in which an issue or problem emerges; (2) exploration phase of brainstorming, questioning, or exchanging information; (3) integration phase constructs shared meaning within the community of inquiry; and (4) resolution is the closure or action taken to resolve the issue or problem posed.

Fahy (2002) noted that the four-phase analysis tool developed by Archer et al. (2001) is a sentence-level analysis tool. He and his colleagues "offer a different approach, focusing on content and interaction patterns at the component level of the transcript: the sentences of which it was composed" (n.p.). His message-level analysis tool is called a Transcript Analysis Tool (TAT). The following are his TAT categories: (1) vertical and horizontal questions, (2) referential or non-referential statements, (3) reflections, (4) scaffolding and engaging comments, and (5) quotations, paraphrases, and citations. In the first category, *vertical and horizontal questions*, vertical questions have a "correct" answer and horizontal questions do not. In the second category, *referential statements* make reference to the preceding statement, whereas *non-referential statements* do not invite response; their main intent is to give information. *Scaffolding and engaging comments,* the fourth category, are intended to initiate, continue, or acknowledge interaction. *Quotations, paraphrases, and citations,* the fifth category, use text for resources and give credit to those resources.

Jeong (2003) used a content analysis coding system to analyze online discussions. The coding system consisted of the following twelve categories: (1) position statements, (2) disagreement statements, (3) agreement statements, (4) arguments, (5) personal experiences, (5) literature, (6) formal data, (7) personal or hypothetical actions, (8) evaluation or critiquing of arguments, (9) summary, (10) negotiation or conclusions, and (12) process comments. Jeong noted that position statements were most likely supporting or opposing arguments, and arguments were likely to generate additional arguments in subsequent responses. Disagreements were rarely posted in response to position statements, whereas agreements were ten times more likely to be posted.

Course Background

The Department of Library and Information Science (LIS) launched the first online degree completion program at the University of Pittsburgh. In May 2001, the inaugural class logged in to this FastTrack program leading to a Master's Degree in Library and Information Science (MLIS). The initiative was designed to support Pitt's emphasis on flexible course delivery to distance audiences and to respond to the growing need for library and information science education.

The online FastTrack program is a two-year, cohort-based curriculum consisting of 36 graduate credits. The community of learners complete the program together in two years by taking six credits per term. They bring a variety of undergraduate degrees to the MLIS program—elementary education, art history, zoology, and social work, among others. Most members of the cohort have some library experience. Students interact with one another, their instructors, and the course material through Blackboard®, a system commonly used by higher education for presenting online courses.

Major strengths of this program are the consistency of the instructors and the continuing relationships of the student cohort members. The cohort concept enhances the learning experience by providing supportive peer relationships for academic and social situations. We found the cohort model increases retention rates and establishes an ongoing community of learners. In addition, the same instructors who teach the MLIS face-to-face courses develop and teach the online courses.

In the first term of study, FastTrack faculty set guidelines for student participation in the asynchronous discussions. Initial student postings are limited to frequency and length (word count) in order to promote concise writing and the opportunity for all learners to participate in meaningful discussion. Small group discussions involve 12 to 14 participants because this maximizes active involvement. These guidelines provide structure to help students new to distance and graduate education by setting expectations. FastTrack instructors believe skills leading to focused discussion are transferred to other courses.

The 21 (16 women and 5 men) students in this study were in their sixth term of the FastTrack program. Therefore, they were already familiar with the cohort members and with instructors' expectations for discussion participation. Learners were no longer held to the participation requirements of the first term, but were ready to contribute in a meaningful discussion of the topics. Critical to the success of this course is the knowledge gained from the active discussion of cohort members. At this point in the program, students have the confidence, knowledge, and familiarity with the cohort members to generate rich discussions. This learning environment provides multiple opportunities for students and instructors to interact.

Methodology

We examined the structure and content of Discussion Forums that were presented within Blackboard. For this formative evaluation, we wanted to examine a variety of types of threads. In order to do that, we scrutinized the structure of the threads, as provided by Blackboard, and identified one thread that was deep, one that was broad, and one that was complex.

Focusing on Discussion Threads

Originally, we thought that it would be possible to determine the complexity of threads by working directly from the visual representation as provided by the Blackboard® application. Although initiating postings and responses to those postings are all represented in the illustrated structure shown in Figure 1, nevertheless, we struggled as we attempted to determine "who" responded to "what."

Figure 1: Structure of expanded discussion as provided by Blackboard®.

Others have also found the structure of online discussions to be challenging and limiting. For example, Wijekumar (2005) described discussion boards as "unwieldy" (n.p.) and Xin (2002) noted that asynchronous communication systems offer fairly "primitive discourse structures" (p.22). We found that it was easy to get lost in the mechanics and confusion of expanding branches, reading postings, and closing postings. It was difficult to visually determine the "level" of responses in the Blackboard® view. That was important to us since one of our suspicions was that the type of cognitive skill exemplified might vary between postings in broad, deep, or more complex threads; moreover, we wanted to be able to draw some conclusions about postings at the same "level" within a thread. By "level" we meant how many steps away a contributed posting was from the initiating posting.

We needed to find a mechanism wherein we could store our comments and observations about the Blackboard Discussion Forum entries while, at the same time, see where they fit within the entire thread.

Mapping the Threads

We selected three discussion threads to examine: one thread was deep, with many "levels" of responses; a second thread was broad, with many responses at the same "level"; and the final thread was extremely complex, with many branches at many levels.

Looking for ways to visually represent the threads and their content, we found that some researchers (Thomas, 1999; Ahern et al., 1992) had mapped Discussion Threads into tree structures to help them analyze communication activities. Using a similar technique, we employed PowerPoint® for visualization of the threads and Microsoft® Word for capturing our evaluative comments. Each node OR CIRCLE represents a posting, identified by the initials of the student. Links were included in the PowerPoint file, leading to each posting. We used a PowerPoint file saved as html, but other applications could have been used as effectively.

To code each of the postings, we examined the content, made coding decisions, and edited the appropriate Word document. When that exercise was complete, we could easily view the structure of the examined threads *and* link to the coded postings. This PowerPoint view allowed us to quickly see how many contributions were made by a student and the complexities of the communication thread in general.

Figure 2 shows the hyperlinked PowerPoint file used to examine a "deep" thread (7 levels). This mapped thread is the same as that in the shaded area of Figure 1. We found the structure as shown in Figure 2 was easier to decipher than that in Figure 1.

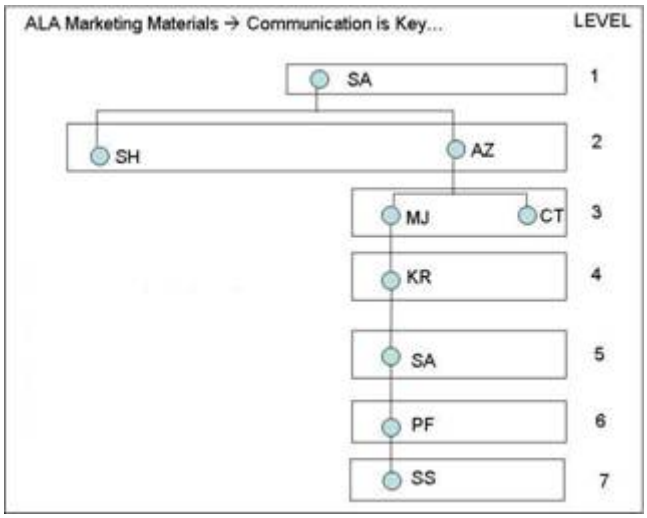

Figure 2: PowerPoint file illustrating "levels" within a discussion thread.

Each of the nodes is identified with the initials of the contributor and each is hyperlinked to a file containing the coded posting (see Figure 3 for an example).

Figure 3 shows a sample of a Word file representing a specific posting. The file is accessed by clicking the hyperlink on the PowerPoint file.

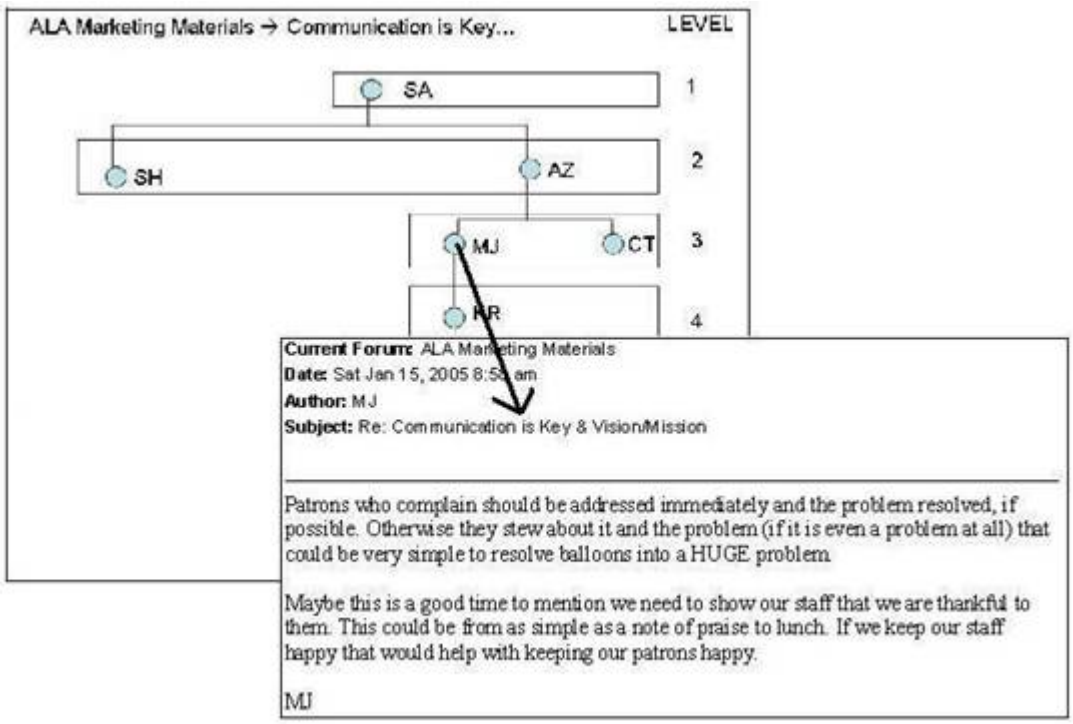

Figure 3: Click on one of the nodes within the structure to display the posting.

Coding the Postings

Our original intent was to code each entry as to cognitive skill displayed, but on our first examination of entries, we found that indication of cognitive skill was not enough. There were some postings that could not be categorized according to cognitive skill. Instead of rejecting those entries, we looked at literature to find ways that we *could* categorize them. We devised a Discussion Board Analysis Tool to use as we examined each student posting, whether it exhibited cognitive skill or items that could not be categorized by cognitive skill. That tool was considered to be a "prototype" but was based on the work of a number of learning theorists and researchers (Jeong, 2003; Fahy, 2002; Archer et al., 2001). For analysis purposes we used the entire message as the unit for examination (Archer et al., 2001).

The following steps describe our coding process:

1. We coded each posting *statement* as to the type of cognitive skill represented. This enabled us to evaluate whether the level of the posting was correlated to the type of cognitive skill in Bloom's Taxonomy. We coded the entry with the highest (according to Bloom) cognitive level exhibited. Figure 4 shows the types of verbs that were used to operationalize the Taxonomy levels.
2. We determined if a *question* was posed. This strategy was adapted from the Transcript Analysis Tool (TAT) set out by Fahy (2002). This enabled us to determine whether student questions prompted richer and more diverse threads.
3. We coded each as to whether a *reflection* (supporting, dissenting, independent, or personal experience/opinion) was present. This is also adapted from the TAT (Fahy, 2002).
4. We indicated if a posting was an *affirmation* or *social comment*, similar to that proposed by Jeong (2003).

Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
List	Summarize	Solve	Analyze	Design	Evaluate
Name	Explain	Illustrate	Organize	Hypothesize	Choose
Identify	Interpret	Calculate	Deduce	Support	Estimate
Show	Describe	Use	Contrast	Schematize	Judge
Define	Compare	Interpret	Compare	Write	Defend
Recognize	Paraphrase	Relate	Distinguish	Report	Criticize
Recall	Differentiate	Manipulate	Discuss	Justify	
State	Demonstrate	Apply	Plan		
Visualize	Classify	Modify	Devise		

From: www.umuc.edu/ugp/ewp/bloomtax.html

Figure 4: Operational Verbs

So, our final Analysis Tool is shown in Figure 5 below. If a message had elements that represented more than one Category of Contribution, we listed each.

Category of Contribution	Detail
Statement	Level of cognitive skill
Question	
Reflection	Supporting, dissenting, independent, or personal
Affirmation or Social Comment	

Figure 5: Discussion Board Analysis Tool

We examined each posting in the Discussion Thread and entered our Analysis Tool evaluative remarks directly onto the MSWord files. We also added date and initials of the coder. Both coders independently coded the entries and, for those few times that there were differences of opinion, we met to agree on categorization. Instructor comments and instructions were not coded since our aim was to investigate the contributions made by students in the online class. For an example:

Current Forum: ALA Marketing Materials
Date: Sat Jan 15, 2005 8:58 am
Author: MJ
Subject: Re: Communication is Key & Vision/Mission

Patrons who complain should be addressed immediately and the problem resolved, if possible. Otherwise they stew about it and the problem (if it is even a problem at all) that could be very simple to resolve balloons into a HUGE problem.

Maybe this is a good time to mention we need to show our staff that we are thankful to them. This could be from as simple as a note of praise to lunch. If we keep our staff happy that would help with keeping our patrons happy.

MJ

Statement - application
Reflection (personal) – BF 15 March

Figure 6: Posting Annotated using the Discussion Board Analysis Tool.

Discussion

The literature shows that analysis of asynchronous communication focuses on either quantitative or qualitative data with many ways to examine and evaluate the interaction of participants. There is not one set of analysis tools to fit every need or situation. Xin (2002) offers a good summary of measurement instruments used in studies of computer-mediated communication (CMC). Since online discussion technology is being upgraded at a rapid rate and since researchers often approach a topic from different viewpoints, one cannot be surprised at this myriad of available methodologies and tools. In our study we initially sought existing tools to use in our analysis; we found none that we could use unmodified. From the models that we examined, we pulled elements from each to create a tool that allowed us a broad perspective of student interaction and critical thinking. Using our customized Discussion Board Analysis Tool, we were able to examine postings and to verify characteristics of asynchronous communications that we had uncovered in our literature review. We found our analysis methodology and resulting flow diagrams, successful for visualizing data and for aiding in the coding of postings. This process met our goal to develop a useable approach for formative evaluation, rather than to do rigorous analysis with associated interrelated correlation.

The results enabled the instructor to modify her questions and facilitation techniques to engage her students in higher level thinking skills. While we do not suggest that this process should be used for every discussion thread, occasional use can highlight areas in need of possible improvement for an instructor. Not surprisingly, our analysis showed that open-ended questions or comments solicit answers at higher cognitive levels according to Bloom's Taxonomy than did direct questions/comments. On the other hand, we had expected that postings appearing "deeper" into a discussion forum would illustrate more thoughtful and higher levels of cognitive skills. This did not happen; high level cognitive skill was demonstrated very early in respondent postings in some threads. Note that while we coded categories other than cognitive skill (i.e., question, reflection, affirmation) when we examined postings illustrating these other categories, there were no trends that could lead to recommendations for the instructor.

Part of the problem we initially experienced in our analysis was determining exactly where a posting occurred within the structure of a large communication thread. While online discussion systems enable postings to be displayed by date, by structure (i.e., where the posting falls in the dialogue), or by contributor, it can be confusing to understand the details of any thread. This confusion is an unfortunate result of the cryptic views presented by the bulletin board software, but could have been ameliorated somewhat if students had modified the subject line of postings to provide clues about the content of their contributions. More precise subject lines could have aided students as they navigated through the discussion forum. Others have also made this suggestion (Hara et al., 2000; Pelz, 2004).

Any online forum is a culmination of the directions and requirements given by the instructor. The literature shows that some discussions are highly managed and regulated with precise directions for number and quality of contributions expected from students (Tu and Corry, 2003; Hara, 2000), while other studies look at free-style, spontaneous threads focusing more on the social aspects of online forums while also examining the quality and quantity of content (Knupfer et al., 1997; Savicki, Lingenfelter and Kelley, 1996). Since student behavior is driven by instructor requirements and expectations, those requirements are strong forces in the actual content of any thread. For example, if students know that they are expected to exhibit higher levels of cognitive skill in their responses, they will aim to do that and any examination of level of cognitive skill would be rather meaningless. In our case, students were directed to participate in the discussion

forums and to be alert to new forums as they were begun by the instructor, but they were free to respond in any way they saw fit.

Limitations

This research adds to the body of literature analyzing online asynchronous discussions, particularly that dealing with formative evaluation and analysis tools. The results are not generalizable to a larger teaching population.

As Allan noted (2004), content analysis is time consuming. Content analysis requires coding and that coding cannot be automated. We found that the effort in mapping the discussion structure and coding the posting was necessary. The resulting coded and linked files were critical to our analysis of the threads and our ability to see trends in the interactions. Additionally, it is our expectation that, as course management systems mature, the ease of building and understanding discussion maps will be enhanced through application programming interfaces.

In this formative evaluation we did not have opportunity to design a controlled study but were looking for recommendations to *improve* interactions within the forums. We did not examine inter-rater or intra-rater reliability or validity for categorizing the student postings.

Further research is needed to determine how student interaction and critical thinking in asynchronous communication mode affects performance (i.e., online course satisfaction and achievement measures).

Recommendations

As we designed and implemented this formative evaluation, we saw the following as being important issues:

> *Students need some basic training and guidelines to effectively participate in asynchronous discussion--how to write concise postings, how and when to start new threads of discussion, how to use subject lines, how to post timely responses, how to format text for readability, and how to adhere to online etiquette guidelines.*
>
> *To avoid student confusion and misunderstanding, the instructor must set clear rules for expectations on frequency of contributions, etiquette and tone of postings, weight of participation toward course grade. Learners can quickly take control of a discussion but need guidance (Peters, 2004) to be sure that they are meeting course requirements and instructor expectations. If the goal of a forum is to encourage higher levels of thinking, more structure from the instructor is advisable in order to enhance cognitive quality of posting.*
> *(Gilbert and Dabbagh, 2005).*

In order to expedite classmates' understanding of the structure of a discussion forum, subject lines should be used as advanced organizers. Ausubel (1963) proposed advanced organizers as a strategy to help students learn large amounts of material. As Allan (2004) noted, the more intensive the discussion, the more postings that will be generated. The subject line organizers introduced in advance of learning can bridge between new learning material and existing terms and concepts. Each posting (including a Reply) should have a new subject line (Monroe, 2003).

Unless there is a student assigned as a moderator, those who start a thread should be expected to do some type of moderation, wrap up, or summary. This is in agreement with others (Hara et al., 2000).

We would recommend use of analysis tools similar to those used in this study for focused, formative types of evaluation, especially studies aimed at improving the use of discussions. The pairing of the mapping process and coding tool was effective to support our formative evaluation of student interaction and critical thinking. The mapping illustrated connections between the postings at various levels, and the tool standardized our analysis of postings.

Conclusion

When the learning context changes from the traditional classroom to the online asynchronous textual context of computer mediated communication, strategies for teaching and learning also change. Knowing how to design and facilitate effective threaded discussions is critical for faculty teaching online courses. Asynchronous discussions take Web pages from being static information to being dynamic instruction. As formative evaluation, discussion mapping described in this study provides an effective means of viewing a large number of interconnected messages. The map provides an instant overview of the discussion process, including interaction patterns and the level of thinking.

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Editor's Note: Constructivism is a widely accepted philosophy for learning, especially in online classes. Brent Muirhead examines how building concept maps can facilitate research, interpretation, product development, collaboration and assessment of conceptual materials using a graduate education course as an example. He uses this opportunity to show how these procedures incorporate research and best practices in teaching and learning, and how environmental factors may affect the outcomes.

Creating Concept Maps:
Integrating Constructivism Principles into Online Classes

Brent Muirhead

Introduction

The author will describe a lesson plan for creating concept maps using the constructivism learning environment for an online class. Students will be challenged to create a definition of good character by developing mental models using Inspiration software. A description of a six step constructivism learning environment for a graduate education online class (EDD520 Critical Issues in Education) will be discussed. Students will create definitions by conducting research from the Internet, utilizing course resources, and collaborating with classmates with assistance from their teacher. The final phase of the assignment will involve producing individual concept maps based on the student's description of good character by using Inspiration software.

Constructivism

The constructivist educational model is based on rigorous academic standards and expectations, and requires educators who are capable of equipping students to be independent learners. Teachers are considered to be knowledge experts who have a clear understanding of their subject matter and their role is to promote self-directed learning activities to cultivate acquisition of knowledge through individual and group studies. Teachers are challenged to carefully design instructional activities that guide their students into relevant learning situations that promote personal acquisition of knowledge. Teachers strive to encourage positive learning habits that foster both self-directed learning styles and genuine collaboration with other classmates. It requires planning creative instructional assignments that intellectually stretch their students but do not confuse or overwhelm them (Sorden, 2005).

Constructivism is a student-centered approach that places responsibility on students to take charge of their learning experiences. Teachers create activities and assignments that foster the creation of knowledge. Students are challenged to produce reality based products such as portfolios and papers. The constructivist educational philosophy operates on a basis of four major assumptions:

1. Knowledge depends on past constructions. We know the world through our mental framework and we transform and interpret new information through this framework.
2. Constructions come through systems of assimilation and accommodation into our existing mental framework. If information is incongruent with that framework, it cannot be assimilated. But we can develop a higher-level of cognition to accommodate this new information and zones of new development.
3. Learning is an organic process of invention, not mechanical. Knowledge is more than facts or information. Learners must be able to hypothesize, predict, manipulate, and construct knowledge

4. Meaningful learning occurs through reflection and scaffolding of new knowledge upon existing framework of knowledge. Cognitive developmental abilities play a key role in all four premises and the ability and evolution of each student's ability to learn and assimilate knowledge. (Constructivist Model, nd, para 3)

It should be recognized that researchers and writers have raised academic issues involving the application of constructivism in today's classes. Educators are concerned about students having to teach themselves vital knowledge content areas and whether students are truly understanding basic subject concepts. Assessment of constructivism activities can be more difficult due to the qualitative nature of the activities which could increase the level of subjectivity during evaluation and grading of student work. (Constructivist Model, Criticisms, nd,).

Educators should be selective in choosing a topic for using constructivist methods because the key is to implement the method that most effectively meets the learning objectives. Often, the emphasis is on developing reflective thinking skills and less on learning specific factual material. Roblyer (2004) raises four concerns about constructivist teaching methods:

- It is difficult for teachers to certify individual's skill learning.
- Prerequisite skills may be lacking.
- Students may not choose the most effective instruction.
- Skills may not transfer to practical situations (p. 72).

Advocates of the constructivist model are aware of these criticisms and educators are continually striving to improve their use of this innovative paradigm. It has grown more popular among educators who appreciate the emphasis on student creation of knowledge and the opportunity to develop rich instructional activities. Teachers are producing creative assignments that utilize textbooks, computer software programs (i.e. electronic portfolios) and the Internet. Students can learn a variety of new skills such as how to scaffold knowledge and cultivate problem solving skills (Constructivist Model, nd). "Constructivism represents a paradigm shift from education based on behaviorism to education based on cognitive theory" (Gagnon & Collay, nd, para 3).

Educators who are seeking to develop constructivist instructional plans should consider reading research studies on those who have tried to implement it into their classes. Black and McClintock (1995) have created an educational paradigm based on the principles of constructivism. The model, called the Interpretation Construction (ICON) Design Model, reflects how cognitive psychology, technology and constructivism can be integrated into instructional activities. There are seven steps to the ICON model (Black & McClintock, 1995, para 2).

- **observation:** Students make observations of authentic artifacts anchored in authentic situations.
- **interpretation construction:** Students construct interpretations of observations and construct arguments for the validity of their interpretations.
- **contextualization:** Students access background and contextual materials of various sorts to aid interpretation and argumentation.
- **cognitive apprenticeship:** Students serve as apprentices to teachers to master observation, interpretation and contextualization.
- **multiple interpretations:** Students gain cognitive flexibility by being exposed to multiple interpretations.
- **multiple manifestations:** Students gain transferability by seeing multiple manifestations of the same interpretations.

The ICON model is appropriate for larger instructional projects which contain the level of complexity and the necessary time to adequately engage in each of the steps. Smaller assignments would probably require deleting the cognitive apprenticeship step due to time constraints.

The author has created an instructional model to describe a constructivist learning environment for an online graduate education class. Students will study character education as part of their course work for EDD520 Critical Issues in Education. The assignment will involve students creating a definition of good character by creating a concept mind using Inspiration software. Royer and Royer (2004) conducted a research project with two high school biology classes using Inspiration software. The investigation affirmed that students who designed maps with the computer software were able to generate more complex maps than those who used paper and pencil for their work.

What Students Will Learn

The author will create an instructional activity based on constructivist principles for an online graduate education class at the University of Phoenix. Students will study character education as part of their course work for EDD520 Critical Issues in Education. The class is a required for individuals who are pursuing a master's degree in education. Usually, the online education classes are approximately 12-15 students in size and the courses are six weeks in length (UOP Fact Book, 2005).

The assignment will involve studying character education and the moral theories associated with this educational issue. Contemporary writers have heavily criticized Kohlberg's cognitive-developmental theory. Woolfolk (1990) notes that his stage theory fails to show how people make moral choices. Frequently, people will operate within several stages within a moral episode. Additionally, the sequence of stages reflects a bias for Western values such as individualism. Some cultures place a greater emphasis on family or group oriented decision-making. Feldman (1997) raises concerns that his theory does a better job of describing moral judgments and struggles when predicting actual behavior. For instance, one experiment revealed that students who were considered to be operating in the post-conventional stage (highest moral category), 70% of them were found cheating on a task. The study reveals that knowing what is right or wrong does not always translate into positive moral behavior. Woolfolk (1990) cites a research study of 1,100 high school students who gave three reasons for cheating: "too lazy to study, fear of failure, and parental pressure for good grades" (p. 108). Every moral developmental theory must deal with the reality that individuals can have ethical knowledge but choose to ignore it.

The studies cited demonstrated various dimensions of investigating moral theories. A valid and logical question for researchers is how can they evaluate moral development theories before encouraging others to use them in schools and business settings? Moral developmental literature contains an advocacy element that sometimes complicates the reader's ability to evaluate the educational merit of every theory. Individuals need to devote time and energy into studying the validity of moral development theories. Thomas (1997) has done extensive investigations into analyzing moral theories by asking specific questions and here are several that are quite relevant:

1. *Moral versus immoral*: from what kinds of evidence and modes of investigation does the theory draw its substance?
2. *Sources of evidence*: what guidelines do the theory offer for deciding whether a thought or act is moral or immoral?
3. *Moral development reality*: what is the theories conception of reality?
4. *Length of development*: how is the length of a person's moral development calculated, and is such development more intense at one time of life than at another?

5. *Personality structure*: what components of personality are important for moral development, and how do these components function?
6. *Directions, processes, and stages*: how is the development defined in terms of directions, processes and /or stages of growth?
7. *Individual differences*: what sorts of differences between individuals are regarded as significant, and what are the causes of those differences?
8. *Nomenclature*: what terminology used in the theory is especially important?
9. *Popularity*: who subscribes to the theory and why? (pp. 3-4)

This brief overview of moral development theories reveals some of the intellectual complexity associated with character education. The author will create a meaningful instructional activity to help students become better acquainted with the literature. Students will be given the following learning objectives for their assignment: create a definition of good character that involves three areas: moral knowing, moral feeling and moral action and create a concept map of their definition for good character using Inspiration software. The assignment is designed to help students become more familiar with the issue of character education and consider the practical implications of implementing aspects of character education in today's K-12 schools. Additionally, students will be encouraged to carefully examine their personal philosophy of education during the course to see whether they need to make any refinements on issues such as classroom management and integrating character education into their daily class routines.

Constructivist Design Model

The assignment will involve students conducting research into character education. Then, the students will develop definitions of good character and translate their definition into a concept mind map by using Inspiration software. The constructivist model has six steps: student instructions/explain situation, research, interpretation, create relevant product, collaboration and assessment.

Student Instructions/Explain Situation

Prior to this assignment, students had already read lecture notes on character education and chapter six of the course textbook (Noll, 2003) that highlighted opposing viewpoints on this issue. Additionally, students will be given notes on the value of concept maps that highlight that they are useful learning tools that can do the following:

- Generate ideas (brain storming, etc.);
- Design a complex structure (long texts, hypermedia, large web sites, etc.);
- Communicate complex ideas;
- Aid learning by explicitly integrating new and old knowledge;
- Assess understanding or diagnose misunderstanding. (Lanzing, 1997, para 1)

The teacher will provide detailed instructions to provide a framework for students to plan and allocate adequate time to complete the work. The assignment has two primary goals is to have students develop a definition and create a mind map of their definition. Students are to produce a definition of good character that addresses three elements: moral knowing, moral feeling, moral action and share three traits for each of these elements. Students will have access to the following resources: class textbook, lecture notes, University of Phoenix online library which contains 20 million full text articles (UOP Fact Book, 2005) and Internet search engines such as Google. This will require doing reading and research to gather definitions and related information.

The second portion of the assignment will involve using Inspiration software to produce a mental map of their definition of character and their maps should include graphics, clear and readable text and they will have one week to complete the project. Additionally, students will write a preliminary definition of good character prior to starting the assignment and email it to their teacher. The pre-assignment exercise will be used to identify the student's knowledge of character education prior to reading the chapter six of the course textbook (Noll, 2003), article readings and participating in online discussions on this topic. The initial definition can be a reference point of information that will be compared to their assignment definition that will be translated into a concept map.

1. Building concept maps

Building concept maps will involve developing from the key concept which is good character and creating links to three elements (moral knowing, moral feeling and moral action). Individuals should start with the key concept (good character) in the center or top of the screen of the Inspiration software program and create links to three elements (moral knowing, moral feeling and moral action). The links serve as a visual way to identify relationships between concepts. Students can utilize their research findings (i.e. articles) and reading of course materials as resources to identify relevant character concepts that can be aligned with moral knowing, moral feeling and moral action. Teachers should remind students that concept maps should be viewed as works in progress. Students should be prepared to make a number of revisions to their maps such as adding, deleting or changing to more descriptive terms.

2. Research

The second constructivist stage involves students investigating materials on character education. Students are encouraged to be active learners who explore textbook readings, Internet sites and article databases in the University of Phoenix online library. The research process has a built in problem solving issues such as locating relevant information and selecting appropriate terms for Internet search engines. There will a need to experiment with different search strategies which will challenge individuals to be patient because certain Internet links might not work and articles will vary in their usefulness. Yet, these are authentic learning situations which "…foster motivation, because students have an opportunity to experience the pleasure and satisfaction inherent in problem solving" (Karagiorgi & Symeou, 2005, p. 19).

Constructivist activities are designed to promote cognitive skills and learning the importance of being persistent when participating in problem solving situations. It is an exploratory stage that empowers learners to use a variety of investigative methodologies such as trial and error to become more sophisticated researchers (Karagiorgi & Symeou, 2005). Students must be challenged to suspend making any permanent judgments on the quality of ideas found in the articles and materials that they have gathered for their mental maps. Teachers operate as facilitators who foster an environment where students work with the minimum of assistance but are available by email or telephone if a student encounters major problems in their initial research efforts. The assignment has been designed to provide adequate time and flexibility for students to effectively complete the assignment and demonstrate creativity in their work.

3. Interpretation

The third constructivist stage is interpretation which involves translating knowledge sources into useable units of information. Students will sift through the information that they have gathered and discern what will help them in defining good character. They will need to examine their Internet articles and check to see if they are reliable and relevant. Individuals will be encouraged to use Kapoun's (1998) five criteria in their evaluations of information resources: accuracy, authority, objectivity, currency and coverage.

This stage requires implementing higher ordering thinking skills to sort through materials as students begin to organize their ideas. Students will compare articles and start making decisions on the usefulness of the information. Teachers should remind students to avoid having articles that are only one dimensional and fail to provide multiple perspectives on character education definitions.

Online learning activities can take longer than the traditional classes with face-to-face interaction. Teachers should consider increasing the amount of time they think is necessary to complete the project if the work is going slower than expected. It is vital that teachers be sensitive to their students needs and demonstrates flexibility in their plans. Instructors can underestimate the difficulty in assisting students to change how they learn and acquire knowledge (Roblyer, 2004).

4. Create Relevant Products

The fourth constructivist stage will require students to create a definition of good character and a mental map of their definition by using Inspiration software. A major benefit of educational software is providing a framework to help students learn more complex tasks through a scaffolding approach. Golan et al (2001) relates that designers have used a range of design approaches to make complex tasks more visible and tractable for learners (para 2)." Students who are new to the software can use a Learning Inspiration (nd) tutorial which provides a solid review for beginners. The teacher can provide coaching, respond to email requests for assistance and offer tips to help students with construction of their mind maps.

Cognitive psychology describes this phase of the learning process as procedural knowledge because it offers students guidance on how to complete tasks. Students will be given some background information on the nature of concept maps and how they can richly represent relationships between ideas through semantic networks (Chan, 2005). Inspiration software helps individuals to operate as designers of their own work and use technology to represent knowledge relationships (Jonassen, Carr & Yeuh, 1998).

Students will be given a grading rubric (see Figure 2) and the following handout which describes how to create a concept map.

- Make a plan and ask yourself the following questions:
  - What are you representing?
  - What points do you want to make?
  - What kind of information is needed to make the points?
  - What assignment goals are you working toward?
- Identify the important concepts.
  - List important concepts.
  - Highlight single words or short phrases that are important for understanding the content which can be obtained through research on good character.
- Create, define and elaborate nodes.
  - Create and label a node for each concept.
  - Add pictures, descriptive text and synonyms to each node when appropriate.
- Construct links and link concepts.
  - Create a link between two concepts and describe precisely the relationship between the two ideas.

- Be sure to interlink existing concepts as much as possible.
- The more interconnected your map is the more meaningful your understanding of concepts will be.

- Continue to expand the map.
  - The process continues until the individual believes the concept of good character is clearly explained.
- Make final revisions and reflect on process
  - Reflections on the quality of the work should be ongoing during the entire process of building a concept map.
  - Review your work, check for spelling errors and asking yourself the following questions:
  - Am I achieving my goal of writing a clear definition of good character?
  - What changes should I make to improve my concept map?
  - What will others learn by seeing my concept map?
    (adapted from Learning Inspiration, nd, para 4)

5. Collaboration

The fifth stage is collaboration. Students will be given opportunities online to share openly their initial definitions and mental models with their online colleagues and teacher. Collaboration fosters multiple perspectives and contextualization of knowledge. Teachers should be aware that graduate students establish convictions, beliefs and ideas from years of previous experiences and education. The student's world view will filter information and influence their observations and interpretation of knowledge. The key is "allowing and creating opportunities for all to have a voice promotes the construction of new ideas" (Dougiamas, 1998, Conclusions, para 4).

Students want intellectually and emotionally engaging dialogs which have connections to their current and future jobs. Integrating cognitive activities into the online setting is a practical way to promote relevant interactivity while effectively meeting course objectives. The mind mapping assignment offers excellent opportunities for students to share their insights and perspectives on character education. Students will post their completed work online which helps them see how others have designed their concept maps.

There might some concerns raised about the possibility of students making negative comments about the work of others. Research studies reveal that when classmates appear to offer more intelligent discussion comments can discourage others from wanting to make comments. It can have a negative impact on the quality and quantity of their discussion postings. If students start to devalue their personal knowledge and life experiences, their online contributions can become more driven by an obligation to get through the experience. Therefore, the teacher must be proactive and remind students in an online note that they should help celebrate the work of others when discussing each others projects. The author's teaching experiences reveals that a short note helps students to share constructive and complimentary online remarks about their classmates work. Students appreciate those who excel in their assignments because it provides examples for them to consider possible ways to improve their school work (Black & McClintock, 1995).

Collaboration will involve the teacher actively interacting with students. The student-centered learning model challenges teachers to carefully use descriptive language in their written and verbal comments to students. Teachers must develop dialogues with their students that foster personal and professional growth. Unfortunately, some professors, through their verbal and

written comments, treat their students as subordinates. Obviously, the instructor's language must be caring and honest while providing constructive feedback that helps the student to have a clear picture of their academic work.

The student-centered model of learning encourages teachers to view their students as academic partners who work together to produce relevant and meaningful learning experiences. It requires educators who are willing to change their standard teaching methods. The author will share a concept map on good character (see Figure 1) as point of comparison and example for students. The graphics were left off the author's map to help stimulate dialog on the use of graphics and explore ways to enhance the communication of ideas. For instance, there could be subjects or topics which could be more effective without graphics. Constructivism favors interaction between students and teachers to foster skill and knowledge development. This assignment is too brief to use cognitive apprenticeships (Black & McClintock, 1995) but they could be used in the University of Phoenix's doctoral programs for dissertation mentoring of doctoral students to assist them in designing and implementing their research plan.

Research studies on constructivism and interactivity point to some interesting preliminary results. Leelawong et al (2001) noted several studies on "…collaborative learning have also shown that students learn more effectively when they work in groups that encourage questioning, explaining and justifying opinions" (p. 73). Taylor and Maor (2000) studied a graduate online class at Curtin University of Technology, Perth, Australia. The research project created a questionnaire known as the Constructivist On-Line Learning Survey (COLLES) to measure both teacher and student perceptions in the following six categories:

1. **professional relevance -** the extent to which engagement in the on-line classroom environment is relevant to student's professional worldviews and related practices;
2. **reflective thinking -** the extent to which critical reflective thinking is occurring in association with online peer discussion;
3. **interactivity -** the extent to which communicative interactivity is occurring on-line between students and between students and tutors;
4. **cognitive demand -** the extent to which communicative interactivity is occurring on-line between students and tutors;
5. **support -** the extent to which sensitive and encouraging support is provided by tutors;
6. **interpretation of meaning -** the extent to which students and tutor co-construct meaning in a congruent and connected manner (Taylor and Maor, 2000, paragraph 4).

Student expectations were met in five of the six categories except in the area of interactivity. A revealing finding was the absence of dynamic dialogue in the class which had structured small group activities that included a systematic change of student leaders and topics. Student online remarks were one-dimensional commentaries that failed to address comments made by their colleagues. The study indicated teachers must create a learning climate that stimulates reflective conversations. Teachers can use comments to shape the type of reflections and collaboration toward consensus building or seek to keep the dialog more open-ended (Raiser et al, 2001). The author utilizes a variety of techniques such as using a thought provoking quote to promote deeper interaction.

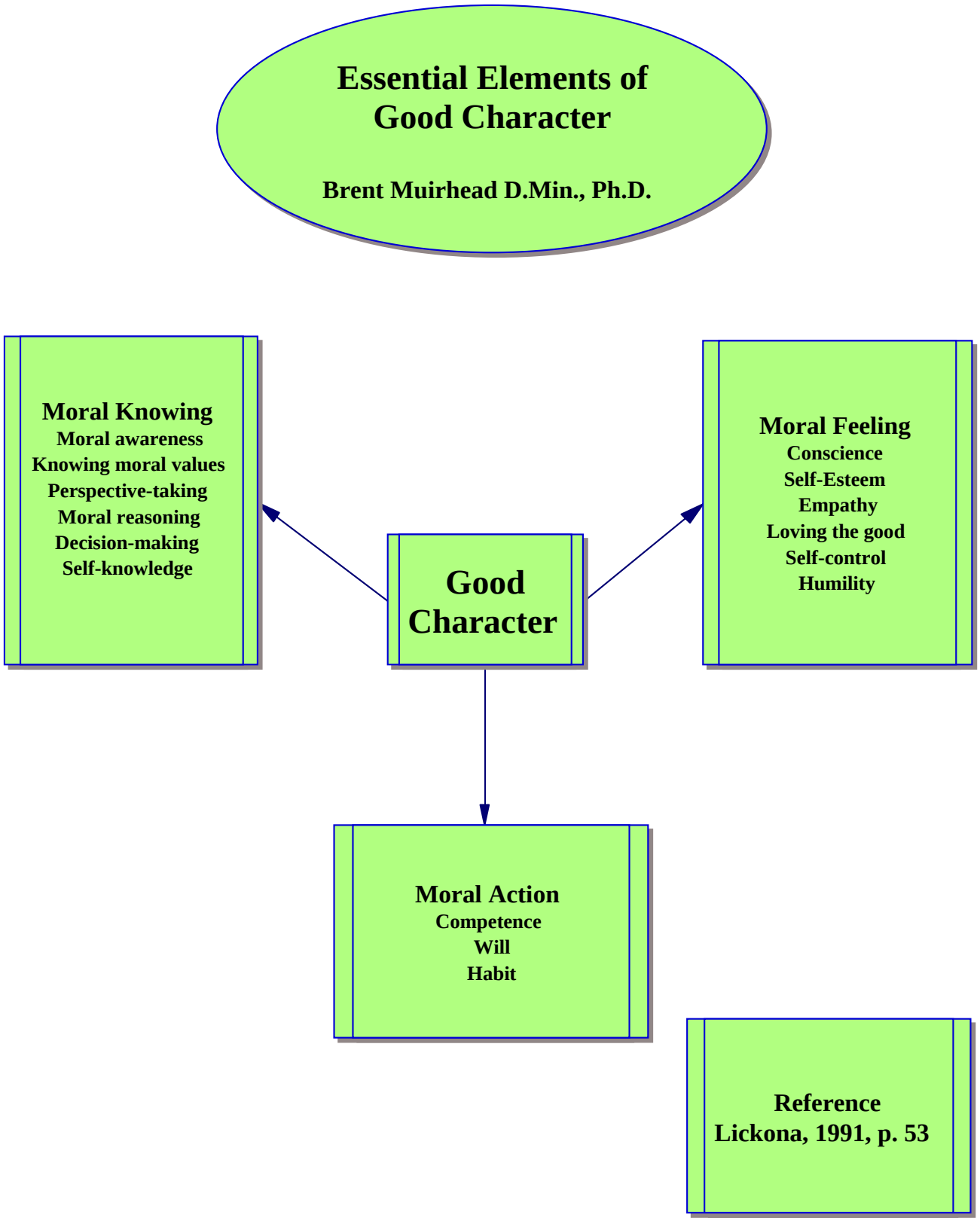

Figure 1. Concept Map.

It is helpful to develop topical handouts to increase student understanding of the subject matter. The author has created a handout and a concept map (figure 1) on good character that fosters discussion about on educational issues such as the various approaches that schools have taken to implement moral instruction into their schools. Students appreciate having a variety of ways to engage in learning about a topic which makes their experiences more meaningful. It is essential that teacher education instructors should model best practices to affirm practical applications of learning theories.

6. Assessment

Students must assume responsibility for their educational experiences, but online independent study has limitations. Individuals vary in their knowledge of the subject matter and their level of cognitive maturity. Also, the quality of online instruction is an additional factor which can influence the learning environment. If learners do not receive adequate teacher feedback and reinforcement, students will not always know whether they possess an accurate knowledge of the subject matter. A primary goal of education is to promote self-directed attitudes and skills while discouraging excessive dependency upon the instructor. Constructivism stresses student creation of knowledge, developing higher order thinking skills and working on meaningful projects (Sorden, 2005). Students are to be "… an active learner interacting with a variety of resources, developing his or her understanding through a mixture of experimentation, experience, and expert guidance" (Edelson, Pea & Gomez, 1995, para 2). The author has selected the concept map assignment to assist students who are either currently teachers or plan to be teachers in the near future. Teachers will feel much more comfortable integrating software and technology oriented activities into their classrooms if they have had opportunities to use software themselves (Leelawong et al, 2001)

Students will be required to create a definition of good character that involves addressing three ethical aspects: moral knowing, moral feeling and moral action. The initial definition can be a reference point of information that will be compared to their assignment definition that will be translated into a concept map. A grading rubric will be used to evaluate the concept maps.

The grading rubric represents an affirmation of learner-centered education. It is a public statement that strives to establish a greater level of trust between the teacher and student. It rejects the notion that grading is a special secret activity that only some of the learners can understand the instructor's actual grading procedures. Secondly, it is designed to establish a set of instructional expectations and standards for individual projects. A rubric provides an instrument for student feedback that promotes assessment of learning. A good rubric will reveal valuable data on how the student's work compares to the learning objectives. Rubrics are valuable because of their capacity to clearly reveal vital information to students that enable them to improve their knowledge and skill levels (Huba & Freed 2000).

Franker's (2005) rubric will be used to assess and grade the concept maps in the following categories: arrangement of concepts, links and linking lines, graphics, content, text and design. The rubric will utilize a basic scale: exemplary 9-10 points, proficient 7-8 points and developing 6 and below. Instructors should consider when it is more beneficial or appropriate to use their concept map projects as exercises without grades to help students focus more skill or knowledge development.

The author is concerned by the strong emphasis on grades and standardized testing which permeates the American educational system which can undermine a student's love for learning. Kohn (2004) argues that "grades tend to reduce students' interest in the learning itself, preference for challenging tasks and … the quality of student's thinking" (pp. 75-76). There is growing evidence that the stress on student achievement measured according scores on standardized tests is having a negative impact on the teaching profession. Sadly, a growing number of educators are

leaving the k-12 schools because the teaching and learning process has been diminished by an excessive focus on testing. The concerns about grade inflation in higher education often miss the real issue about the purposes of education. Is the purpose of education is to sort students for future employers or help individuals improve on their skills and knowledge? It is time to start asking deeper questions about the quality of student learning experiences. The author has been involved in eight graduate degree programs and sometimes professors believe in the motto that harder is better and brag about how difficult it is to earn a high grade in their class. Yet, these teachers often fail to examine the intellectual depth and relevance of their course work. Research studies on course difficulty reveal that the long term learning benefits are negligible and minority students experienced negative results (Kohn, 2004).

Conclusion

Computer-mediated classes offer unique risks and opportunities for teachers and students as part of a new educational frontier. Teachers have to demonstrate courage in experimenting with new instructional activities that might require refinement. Students must overcome their fears when trying something new and unfamiliar to them. Concept maps offer opportunities for teachers to promote the deeper learning of ideas through research, and foster creativity and online dialog between students (White & Gunstone, 1992). Teachers can benefit from students who share with them. "In studying constructivism through my recent course, it has become apparent that one of the most important processes in developing my knowledge has been by explaining and exploring my ideas in conversation with fellow students" (Dougiamas, 1998, Constructivism, para 1). The concept map assignment has a variety of instructional uses such as stimulating class discussions and identifying gaps in student knowledge of subject content. Anderson's (2005) research on cognitive tasks indicates that procedural and declarative knowledge can be strengthened through practice. Therefore, it would be wise to follow up this project with another concept map activity to help students build upon their learning experiences.

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Editor's Note: This study reinforces the significance of eLearning for professional development and its ability to support unserved and underserved populations. It also explores parameters that influence learner comfort and success influenced by language, culture, geography, learning style preferences, technology literacy and technology support.

Promoting Comfort in E-Learning for Professional Women: Examining Access, Language and Culture, Learning Preferences and Role Integration

Mary-Anne Andrusyszyn and C. E. (Betty) Cragg

Abstract

E-learning, from the context of distance education for professional women, is discussed in this paper. Studies conducted with women, principally nurses, in graduate and undergraduate distance programs, that reflect the issues of gaining comfort when studying by distance education are highlighted. An overview of some of the technological and design conditions that contribute to e-learning environments which enhance students' success in and satisfaction with distance programs and promote knowledge development are presented. Specifically, comfort is addressed as it relates to technological access, learner preferences for distance delivery methods, language and culture, and integration of the e-learning role into one's life.

Keywords: e-learning, professional women, learning preferences, role integration, distance education

Introduction

E-learning encompasses any technologically-mediated interaction between teacher and students and among students. It includes online communication, print-based materials, and audio-and video teleconferencing. For e-learning to be successful, learners must achieve comfort in technologically-mediated environments so that they can concentrate on learning outcomes rather than technology. Discomfort may arise from the technology, the language and culture of the teacher, fellow participants, and/or course, as well as the role integration required to learn from home using technology.

E-learning, from the context of distance education for professional women, is discussed in this paper. Studies conducted with women, principally nurses, in graduate and undergraduate distance programs, that reflect the issues of gaining comfort when studying by distance education are highlighted. These include students in the Primary Health Care Nurse Practitioner (NP) post-baccalaureate certificate program offered in Ontario, Canada through a 10-university consortium since 1995 (Andrusyszyn, et al., 1999; Andrusyszyn, Cragg, & Humbert, 2001; Cragg, Andrusyszyn, Humbert & Wilson, 1998; Cragg, Humbert, & Doucette, 2000; Cragg, McLean, Andrusyszyn, Doucette & Mes, 1998; Cragg, Humbert, & Doucette, 2004; Doucette, Cragg & Humbert, 2002). Additionally, they include a study that linked Canadian and Norwegian nursing graduate students through computer-and videoconferencing (Andrusyszyn et. al., 2001; Iwasiw et. al., 1999; Moen et. al., 2000), as well as recent work with women in Canadian distance education programs (Cragg, Andrusyszyn, & Fraser, 2005).

An overview of some of the technological and design conditions that contribute to e-learning environments which enhance students' success in and satisfaction with distance programs and promote knowledge development are presented. Specifically, comfort will be addressed as it relates to technological access, learner preferences for distance delivery methods, language and culture, and integration of the e-learning role into one's life.

Women in Distance Education

Women are important participants in distance education in Canada. Many professional women are taking distance courses to advance academically, gain credentials, and maintain or enhance professional competence (Bray, 1988; Coulter, 1989; Gwyther, 1999). Before the advent of readily accessible professional education by distance, participating in continuing education placed a considerable burden on professional women. Many had to travel long distances to access educational opportunities despite family, work, and community obligations. The role of student was added to their already complex lives as employees, employers, spouses, mothers, community volunteers, and caregivers for elderly and ill relatives (Crosby, 1991; Repetti, 1987; Repetti, Matthews & Waldron, 1989). Making a commitment to continuing education, although professionally and personally desirable, required more sacrifice than many women could accept or manage. Distance education eased the integration of the student role into busy lives, facilitated access to programs, and enhanced learner control over timing and location of educational efforts.

One of the challenges professional women as distance learners face, however, is adapting to and gaining comfort with the technological learning environment (Fraser & Haughey, 1999). Nurses and other mature women who have not been previously exposed to computers in their education may be daunted by the prospect of relying on computers and the Internet for their education. Using unfamiliar technology, engaging in learning activities not congruent with learning preferences, or studying in places or at times that interfere with life circumstances, may lead to discouragement or frustration. Learners may be unable to readily achieve cognitive and affective learning outcomes intended by program developers (Hara & Kling, 2000).

Comfort in the learning environment is fundamental for student achievement. Adapting quickly to an e-learning environment and shifting concentration from the context to the content of the learning experience are essential for success. Ideally, learners can achieve this comfort when educational programs ensure an infrastructure that supports learners' adaptation to delivery methods, and develop course designs that are congruent with the content and complement individual learners' preferences and experiences.

Promoting E-Learning Comfort by Easing Technological Access

The Nurse Practitioner Experience

One of the prerequisites for comfort in e-learning is developing the ability to access the online environment and navigate within the program (Bates & Poole, 2003). From annual data collected from participants enrolled in the Primary Health Care Nurse Practitioner (NP) Program offered by distance through a consortium of 10 Ontario universities since 1995, program administrators were concerned that it took a majority of NP students and professors at least 6 weeks to log on and feel comfortable communicating in their courses (Cragg, et al., 2004). While a number of distance delivery methods were used, computer-based learning materials, conferencing, and chat rooms were increasingly important. Spending 50% of a 13-week term adapting to the learning environment was a major source of discomfort and anxiety to students. They were frustrated by their inability to navigate and participate easily in their courses. As a result, they were not focused on achieving intended learning outcomes such as expanding their knowledge about diagnostic reasoning, evaluating changes in their roles and responsibilities, or applying critical reasoning to the evidence supporting their expanded practice.

To help these learners adapt more rapidly to the e-learning environment, a "toolbox" of strategies developed with funding from the Office of Learning Technologies (OLT) of Human Resources Development Canada (HRDC) was tested (Cragg, et al., 2000). The project allowed refinement of existing materials and approaches, creation of new strategies, and systematic evaluation of the toolbox. Since implementation, support strategies continued to evolve with annual revisions

(Doucette, et al., 2002). These included written materials sent to learners on admission to help them purchase or upgrade computers, select an Internet Service Provider (ISP), and log on to the program. Frequently Asked Questions (FAQs), and online guidelines assisted students with particular tasks. A CDROM providing learners with standardized versions of software required for the program and supported by the program's technical support staff, tutorials for software, and video-clips of professors introducing their courses, were also developed. Standardized software minimized downloading problems; prevented being timed-out by ISPs during downloads; and provided common software.

Strategies were implemented to help students learn the necessary technical skills before they began courses. They attended a mandatory, standardized, face-to-face orientation with extensive hands-on practice. Chats were scheduled to let students log in and practice synchronous participation from home. Online self-tests helped students demonstrate their ability to log on to discussions, and send and receive both e-mails and attachments. Online pre-course tests assisted students to identify gaps in prerequisite knowledge necessary to succeed in the program, and provided practice with the program's online exam format. Human support was also available by telephone and e-mail, and the majority of students contacted their assigned support person for help and advice at least once, usually at the beginning of the program.

Pre- and post-surveys to assess NP students' attitudes to computers and computer efficacy with a number of tasks were conducted on admission and completion of their first term in the program (Cragg, et al., 2004). Students also reported on their experience with the toolbox elements and how rapidly they were able to log on and feel comfortable in their courses. Interestingly, the group admitted the first year *after* the toolbox was implemented showed few differences on questionnaire results from the group admitted the year *before* the toolbox was developed. This lack of difference may be partly attributed to supports already in place before the project began (e.g., written materials, FAQs, orientation), and which were only revised. Another factor noted was that students coming into the program the year *after* the toolbox was implemented demonstrated different initial attitudes for and efficacy with computer skills. That is, although they demonstrated a significant increase in scores from pre-test to post-test, their post-test scores on attitudes to computers and efficacy with required skills did not reach the pre-test levels of the students admitted the year *before* toolbox implementation. These results demonstrate that different groups of students and different individuals within groups, even in the same program, come to their e-learning with varying levels of technological proficiency. Thus, they may require different amounts and types of help. For example, in 2002, 95% of students entering the NP program were online and comfortable communicating in their courses in four weeks or less (Cragg et al., 2004). Thus, a range of flexible supports to address multiple learner needs is helpful and program planners need to keep pace with changing program requirements and student experiences.

The Canada-Norway Experience

Learners' access to e-learning tools can have a profound effect on the quality and experience of e-learning (Andrusyszyn et. al., 2001; Iwasiw et. al., 1999; Moen et. al., 2000). In 1996, 24 nursing graduate students from Canada and Norway participated in an international study, funded by the Network of Ontario Distance Education (NODE), which examined the effectiveness of using computer-conferencing (CC) to link learners in Master's level courses focused on nursing leadership Following an orientation to the technology, participants dialogued online for three weeks using case studies as the stimulus to frame knowledge development. Desired study outcomes were for students to develop common understandings about leadership and health care issues that crossed borders and cultures, and to develop comfort with asynchronous CC.

The ease of access to technology was undeniably different for both groups. Only two of the 16 Norwegian students had personal computers and all came to the university computer lab to access

postings, while all eight of the Canadian students had personal computers at home or had access through their employers. The rich dialogue that one might expect in a CC course was still present, although it was different in nature as Norwegian students did not normally submit individual contributions. They met face-to-face in groups, discussed the cases, and then composed collective responses. Thus, Norwegian students had the opportunity to share individual reflections in person, examine and integrate their ideas, and then contribute shared impressions to the evolving dialogue. This approach was very similar to what normally happens in a face-to-face classroom, yet it was different from the strategy used by Canadian colleagues, who put forward individual responses to the online discussion. Norwegian students were confronted with numerous contributions from their Canadian counterparts each time they entered the system. They had to make sense of what they read, synthesize it, consider responses from their perspective, and then compose a collective response. Lack of easy access to computers meant they had little time to prepare by reading the evolving dialogue and therefore had little opportunity to reflect on individual understandings before contributing. Norwegian nurses had to accelerate their critical thinking and reflection skills to keep the discussion moving. Although a reasonable approach, it was not one educators anticipated. It added a very interesting, but complex, and perhaps unbalanced dimension to the development of the learning activity. Although nothing precluded Canadian students from meeting in groups to discuss the cases, this was not an expectation nor did it occur spontaneously.

Promoting E-Learning Comfort by Recognizing Preferred Delivery Methods

The Nurse Practitioner Experience

Comfort with e-learning is also enhanced when the chosen technology and the design of learning materials are congruent with learner preferences (Andrusyszyn, et al., 1999; Cragg, et al., 1998; Cragg, McLean, et al., 1998). In 1997, NODE funded research studies that examined the consequences of using different forms of technology for NP students in Ontario. An evaluation study of the NP program, funded by the Ontario Ministry of Health, was also conducted at this time (Andrusyszyn et. al., 1999). Nurse practitioners were an ideal group for comparative study of technologies because these students were expected to adapt to a variety of distance delivery methods and rapidly become proficient using them. Anglophone and francophone students responded to qualitative interviews and quantitative surveys (N=86; 71% response rate) in which they identified their preferences for technologically-mediated delivery method (Cragg, 1998; 1999). Their choices were based on individual approaches to learning, type of content to be learned, and experiences with various forms of technology.

Students' preferences for approaches to learning included considering the big picture, setting their own learning plans, and focusing on concrete examples. They preferred learning on their own or in small groups. There were significant associations among several learning approaches and delivery methods. For example, those who preferred learning on their own favored reading. As anticipated, CC was negatively related to preference for learning new things by observation (Cragg, et. al., 1999). At the time the study was conducted, CC was a new technology for both learners and professors. Student reports indicated this delivery method showed the greatest perceived increase in comfort from the beginning to end of the program (Andrusyszyn, et al., 1999; Andrusyszyn, et al., 2001). After having adapted to this e-learning environment, learners were grateful for having developed computer and Internet proficiency, and valued these as transferable and life-long learning skills.

When the NPs were asked to identify delivery methods they would prefer for specific program content, a variety were chosen. Video-teleconferencing was preferred for counseling, political action, and transcultural content. Videotapes were preferred for physical assessment. Using a

CDROM scored high for learning pathophysiological principles and pharmacotherapeutics. For all content areas, print-based materials were rated among the most preferred delivery methods. Reading was perceived as a foundation to learning, a reliable, portable, and familiar approach. Audiotapes, despite their familiarity, were always among the least preferred methods (Cragg, et al., 1999).

Reliability and familiarity were important factors in students' choice of preferred delivery methods (Cragg et al., 1999). Technological breakdown, poor technical quality of materials like videotapes, and lack of familiarity with computers were among the factors that led students to give low ratings to some of the more highly technological delivery methods. Provided they could access materials, students reported they often modified them to suit their preferred means of learning. They printed CCs, taped audio-teleconferences or tutorials, and formed face-to-face study groups. Sixty-five individuals (75.6% of valid responses) acknowledged making such a conversion.

Reflecting upon students' preferences, it is evident that experience with technology and access are important factors in designing e-learning. If students do not have ready access to the requisites for learning, or if they cannot readily adapt to make the e-learning conditions familiar and comfortable, educators run the risk of having students reject or take exception to this mode of learning.

Language, Culture and E-Learning Comfort

Language and culture are factors that should be considered in relation to e-learning comfort (Andrusyszyn et. al., 2001). Canadian anglophone and Norwegian Master's students and Canadian anglophone and francophone NP students, provided interesting perspectives related to linguistic and cultural e-comfort. Even though the Norwegian group's command of the English language was excellent, they required more time to synthesize ideas and present them coherently online. They needed more time to discuss case studies (Andrusyszyn et. al., 2001). They put effort into understanding the nuances of Canadian expressions and viewed this uncomfortable process as one in which they experienced "cultural pain". Analyzing one case per week made sound conceptual and andragogical sense, however, one extensive case, unfolding over time and approached from multiple perspectives over three weeks, might have helped Norwegian learners achieve intended learning outcomes with greater comfort. They would have had time to study the same case from different perspectives and possibly feel less pressured to shift conceptual gears.

In the NP program, anglophone and francophone students studied in their own linguistic groups, although their professors collaborated in the development of parallel course materials and approaches. Quantitative comparisons were difficult because of the small numbers of francophone students. However, it was clear that differences identified were due more to experiences with technology than linguistic or cultural issues. Francophones were more satisfied with audio-teleconferences than anglophones (Cragg, et. al., 1998; Cragg, McLean, et al., 1998). However, this difference was attributed to the fact that francophone courses had smaller enrolments, and therefore, each student could participate more actively in discussions. Anglophone students selected video-teleconferencing as a preferred delivery medium for specific content more frequently than francophones. Anglophones had not been exposed to the medium and believed that visual images would enhance their learning, while the francophones, who had experience with video-teleconferences, had been frustrated by frequent technological breakdowns. In these studies, both groups of NPs had been learning in their own language and culture, and differences in perspectives could be attributed to these factors. Nevertheless, creating a comfortable learning environment is integral to course design. Not only must attention be given to making sure access is unencumbered and smooth, language and culture of participants are important considerations. Access to technology should be parallel among participants to promote balance in discussion.

E-Learning Comfort and Role Integration

In addition to engaging positively with technology, experiencing meaningful through course designs that are congruent with their learning preferences, language, and culture, students need to be able to integrate their role as e-learners into their lives. For example, women assume many roles in society and adding the role of e-learner can upset the balance of their lives (Coulter, 1989; Pym, 1992). To concentrate on learning, they must reconcile competing demands for attention. The issue of student role integration was the focus of studies funded by the OLT (HRDC) with professional women. These two studies examined the advantages and stressors for women of being a distance education student in a professional program (Fraser, Cragg & Andrusyszyn, 2003). A qualitative study (phase one) was based on interviews with 25 Canadian women in nursing and accounting programs. A subsequent quantitative study (phase two) was conducted using a survey based on data from phase one and the literature. Five hundred and eighty one women in accounting, nursing, health studies, business administration, and education completed the questionnaire. While respondents identified some concerns about technology, these were secondary to those about how adding the role of student influenced family and work life. The results provided insight into the factors that influence success in maintaining a comfortable, balanced life while studying at a distance.

Women identified advantages to taking professional education electronically. These included goal achievement, job enhancement, lifestyle changes, and role modeling life-long learning for children and colleagues. Saving travel time and controlling study time to accommodate other demands were important positive factors, especially for those in asynchronous delivery programs. Women responding to the survey items on self-esteem indicated high levels of personal and professional well-being. They also reported they had gained respect from spouses. In items that could be perceived as either positive or negative, depending on the circumstances, flexibility, self-transformation, independence, and accessibility (to education) were rated as positive attributes of distance education by a majority of these women.

Stressors these professional women identified reflected difficulties in adding the e-learner role to many others. Phase one respondents reported that family relationships and friendships suffered as life was put on hold for the duration of the program. Only two of the 25 reported placing their priorities on personal life instead of academic demands. Less time for family and children was frequently mentioned. Guilt or frustration at not being able to “do it all” was evident. In the survey (phase 2), women reported that similar patterns of disruption to relationships occurred. A majority rated interruptibility, a potentially positive or negative characteristic of distance education, negatively. Although a large majority stated they were in good health, a number of somatic complaints were reported in both the qualitative and quantitative study groups. The problems included a decline in fitness, weight gain, increased use of caffeine, sleep disturbances, and eye and ergonomic strains. A number of students commented negatively about group work requirements, viewing them as incongruent with the flexibility they expected in e-learning. Time zones and reduced control over the learning environment made group work problematic, and many believed group assignments had little value for mature students. Correlations conducted on the survey responses revealed that when student control was low, anxiety/stress scores were higher and there were more negative personal outcomes. Anxiety/stress scores were also higher when support was low.

Strategies for success in e-learning identified by these multiple role women included effective time management and reliance on supports from a variety of sources. Support from the tutor, spouse, children, immediate work supervisor, and upper management at work were rated as very important. Actual support received showed similar patterns. However, though tutor support was perceived to be very important, ratings for actual support received were lower.

Recommendations by participants for changes to improve the situation of professional women as e-learners included giving students more control over course requirements, better orientation to the program and technology, and notifying them regularly of program/course changes and updates. These strategies recognize students' complex lives and can improve retention and satisfaction.

This study dealt with women who were succeeding in adding professional programs by distance education to their busy lives. Perceptions of women who withdrew or failed in distance education programs were not examined. It would be worthwhile to discover the problems these learners encountered that led to leaving programs. Given the problems the successful women reported having overcome, consideration must be given to enhancing supports and implementing a variety of teaching and communication strategies so that as many students as possible are able to complete programs.

Conclusions and Implications

A recurring theme evident in the reported studies has been that women who succeed in professional e-learning desire easy, flexible, and meaningful access to technology, have learning preferences but are able to adapt them to their learning contexts, and integrate e-learning into their existing multiple roles to make learning possible. They tolerate technological problems or poor instructional design because, for them, the advantages of distance education outweigh the problems. The women in our studies wove e-learning into their lives, mastered the technological requirements, and demonstrated successful achievement of course outcomes.

Professional women tend to be educated and affluent and thus may have more resources available to them for overcoming problems encountered in e-learning than less advantaged learners. However, their experiences provide useful insights into the needs of all learners engaged in e-learning. These professional women provided many lessons to educators using e-learning that can benefit learners who may not be as determined or well supported. With increasing competition for students and globalization of learning opportunities, distance educators cannot afford to be complacent. If they do not learn from the experiences and difficulties of their students and modify their approaches, they may lose the opportunity to provide educational opportunities.

Among the factors educators must bear in mind is the need for suitable support for learners as they adapt to technology. New delivery methods and software are often tempting as they promise to solve existing logistical and educational problems. The following questions must be carefully considered and answered when developing e-learning courses for all distance students, but for women in particular. How much time and energy will be needed for new students to integrate e-learning into their lives and master the technological environment? What design strategies will support individual learning preferences, as well as language and cultural differences?

Learners, especially those who are not computer literate, or who do not have access to high-speed connections, may be excluded, or at best, marginalized if the technological requirements for courses are too sophisticated. Even for those with computer and e-learning experience, new applications or upgrades may create difficulties. At such times, a *real* person responding in *real* time may be the only way to solve the problems promptly, relieve stress and frustration, and allow students to comfortably concentrate on the business of learning. When supports are in place and students can overcome their technological frustrations quickly, they have shown that they can adapt new delivery methods to suit their personal learning needs, and thus focus on achieving learning outcomes.

Assessing technology for its efficiency and effectiveness for creating positive learning environments is essential. In the research presented, participants expressed preferences for a blending of delivery methods to suit the content and their approaches to learning. They adapted

technologies to match their learning preferences. To appreciate these adaptations is to acknowledge the value of different delivery methods to suit different content, contexts, and learning preferences. Educators should contemplate what they can do to enhance this process, so that students can focus quickly on achieving learning outcomes.

Educational environments and processes are constantly evolving. In traditional educational institutions, students are demanding course websites and e-mail communication with faculty. Technologies first used by distance educators are moving into the mainstream. Web-based platforms and other technologies that are commonplace today were not dreamt of 10 years ago. There will continue to be rapid advances. Students can help educators to exploit the opportunities new communications technologies make possible. We can hope that the 'educational evolution' will become increasingly learner-friendly and learner-sensitive.

Should modifications or alternative activities leading to the same learning outcomes be available for learners who are uncomfortable with a particular delivery method? Placing the learner at the center of the learning circle is integral to arriving at sound and satisfying solutions to many of the problems posed by e-learning. Discussing how learning can be best promoted by a particular delivery method and evaluating the impact of the selected method on the quality of the learning experience should be fundamental to e-learning decisions.

It is clear from the studies discussed in this chapter that a number of technological, educational, and personal factors contribute to comfort with e-learning. E-learning occurs in a challenging and constantly evolving technological environment. Educators and potential learners have to be open to change, while maintaining a healthy skepticism when assessing the value of new technologies or educational approaches. If educators make sure that the learners' needs are always the chief consideration, they will make selections that will promote positive learning experiences. It will be necessary to continue to conduct research on the experiences and perceptions of learners in technologically mediated learning environments to ensure that educators' decisions are truly based on the needs and desires of those who enroll in e-learning programs.

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Editor's Note: This is not a recent study, but it fits well with the context of expanding eLearning to new populations of learners as the technology becomes available. It provides a time dimension to remind us that adoption with confidence or comfort is not an instant process for individuals without prior experience and that comfort in using technology takes longer those who learn at a distance. This study is limited to browsers, but each successive technology, such as messaging and blogging, has its own take-off, development and saturation (s-curve) as described by Derek J. de Solla Price (1963). *Little Science, Big Science*.

A Longitudinal Study of the Uptake of and Confidence in using WWW Browsers among Parks Management Students

Dirk H.R. Spennemann

Abstract

The 1990's saw an unprecedented growth of the WWW. It was assumed that students would correspondingly take up the associated technologies. Between 1995 and 2000 a longitudinal study was carried out to test the usage and confidence of students using WWW browsers in a university environment. The results show that use of the WWW has increased to near saturation levels although a bias is evident between male and female users. A correlation was established between the frequency of use and confidence with which WWW browsers are being used.

Keywords: confidence, WWW, students, longitudinal

Introduction

In the mid 1990s a brave new world of telecommunications in the form of the information superhighway beckoned. It was touted as offering great promise of becoming the great leveller, allowing anybody with access to a server, to gain access to a huge amount of data well beyond that currently available in their local geographical area. Brick and mortar infrastructure would no longer be a barrier to this exciting information age that was available to those who had access to the Internet and more particularly to the World Wide Web (WWW). Information technology has effectively changed the mode of delivery of many of the traditional paper based resources to those now being delivered electronically. It also has brought about an increasing reliance on the use of such technology both as a tool to access communication resources but also as the means to facilitate learning and teaching Australia (cf. Atkinson et al 1997; Spennemann 1999). The technology associated with the WWW has opened up new options in areas from electronic commerce to online education. For example, information technology has now become an integral medium for the delivery of teaching and learning resources in tertiary institutions throughout Australia (cf. Atkinson et al 1997). This increased reliance on technology has meant that people wishing to access information resources need to be competent and confident users of the available technology. The industry and many 'hawkish' proponents assert that this is a given and it should be of no concern. Yet such concerns have been raised for rural areas (Valentine and Holloway 2001) and for poor developing countries (Spennemann et al 1996).

It has been claimed that information technology has a significant impact on education and it technology is an area that students can not afford to ignorant about (Schott and Selwyn 2000). However not all students utilise new technologies in the same way with factors such as gender

(Brosnan 1998; Clegg 2001) and the personal learning styles of the users affecting how they are used (Shuell and Faber 2001). Other barriers that might affect the adoption of information technology in an education environment include the lecturer's attitude or perception about a technology, the student's competency level with the technology, the availability and accessibility of the hardware and the software (Atkinson and Spennemann in press; Honey et al. 2000; Spennemann and Atkinson 2002a, 2002b, in press), the presence of technical personnel and institutional support, and a program for staff development and skill building (Rogers 2000)

From an educational stand point, much of the literature deals with students' learning based on computer aided technologies (cf Spennemann 1998, 1999). Other studies have looked at the attitudes and skill levels of high school students (Meredyth et al 1999, 2000) and first year students (Lim and Kendle 2001, Lim and Lee 2000, Flowers et al 2000, Palmer and Bray 2001, Spennemann 1996).

The authors carried out a longitudinal study into computer use and confidence among Environmental Science Students at an Australian Institution from 1995 to 2000 (Spennemann & Atkinson 2002a). Some aspects such as data management behaviour (Spennemann and Atkinson 2002b), e-mail usage (Spennemann and Atkinson 2002b) and aspects of gender on computing (Atkinson and Spennemann in press) have been reported elsewhere. In this paper we will report on a longitudinal study into the use of the World Wide Web software applications among park management students. The findings from the 2000 study will also be compared to a cohort of students studying information technology.

The Study

A study was conceptualised in 1995 as a quality assurance exercise for the subject PKM 266 Cultural Resource Management, at Charles Sturt University (Albury, New South Wales, Australia). The aim of this study was to assess the computer access, abilities and confidence level of the student population when using the World Wide Web. This exercise developed into a longitudinal study sampling both the entire internal and the entire external student population enrolled in the subject during the period 1995 to 2000. The survey instrument was an anonymous, compulsory questionnaire handed out at first lecture (2nd semester, 1st year). It relied on self-reporting and self-evaluation by the student and elicited the required information through multiple options and attitudinal responses using a 6- and 9-point Likert scale. Because of the quality assurance character of the study the return rate of the questionnaire was 100% of the students attending class.

The survey was administered in 1995, 1996, 1997, 1998 and 2000 to the internal student population and in 1995, 1997 and 2000 to the distance education students. No data were collected for 1999 when the principal author (Spennemann) was on sabbatical and the subject PKM 266 was taught by a relief lecturer.

The cohorts analysed during the respective studies were drawn from students undertaking the Parks Management and Ecotourism degrees taught in the Faculty of Science and Agriculture. From 2000 students in Information Technology were also included in this research. Anecdotal evidence and long-term teaching experience by staff suggest that the bulk of the Parks Management students were apathetic towards computer technology and that many express dislike and even anxiety. In this regard, this cohort of students appeared to be a representative sample of students in 'real world'.

The parks management student population falls into two parts, those students studying in face-to-face mode at Albury campus, and those students studying in distance education mode from their home location. These locations vary widely and range from capital cities (such as Sydney, Brisbane or Melbourne) to parks rangers working in remote national parks with limited

communications access, including delayed mail delivery and unreliable telecommunications. This has always posed a special challenge and the new rollout of technology has not always alleviated this (Spennemann 1995).

The internal students are, on average, straight school leavers (62% aged 18-19 in 2000), while the external students are on average in their early to mid-thirties, are in full-time or part-time paid work, often in related fields or actually as a ranger in one of the parks management services.

With the exception of 1999, the male to female student ratio is close to 1:1 among the internal student population of the core subject PKM 266. The gender balance was originally more skewed towards the males among the external population.

Given the fact that CSU is a regional university, it was of interest to ascertain whether the attitudes towards the use of the World Wide Web might vary depending upon their previous geographical location. About half the student population (both internal and external) came from rural areas, followed by students from non-capital cities and metropolitan students. Among the external student population the percentage of students from rural backgrounds is on the increase.

WWW browser use

A WWW browser is a software application that allows users to interface with the World Wide Web (WWW). The WWW was commercially introduced in 1993 and since that time its usage and growth has been exponential (Haynal 2000). The two most common WWW browsers available today are MS Explorer and Netscape. A WWW browser is simple and intuitive to learn and it is the tool that enables users to access large amounts of on-line hypertext information.

Unlike other applications, such as word processors, spreadsheets and databases, WWW browsers are a recent development and one that is inextricably linked to the development of the internet/WWW as a communications and information provision tool. Thus it can be posited that as the information content increases, as measured in the number of websites and the number of pages, this could and should result in an increase in its use. In short, while standard applications, such as word processors, have a confined market, the WWW continues to be a rapidly expanding resource. The increased popularity of the WWW should be reflected in the use of the WWW browser both in absolute terms and relative to other applications.

For the first part of this research the cohorts were asked to indicate their usage and confidence in the use of the WWW. In particular, participants were asked to self-assess the frequency of use of WWW browsers. Respondents were asked to select one of the following answers with regard to their usage of a WWW browser: ‘never/not yet,’ ‘seldom,’ ‘once in a while,’ ‘often,’ ‘regularly’ and 'daily.'

The popularity of a WWW browser is reflected by the dramatic increase in its usage by the students in this survey (table 1). For example, while in 1995 46% of all internal students had never used a WWW browser this number had decreased to less than 5% by 2000. Similarly, whereas fewer than 2% of students used a WWW browser on a regular or daily basis in 1995, this had increased to 50% by 2000.

Table 1
Usage of World Wide Web Browsers

	Internal Parks					External Parks			IT
	1995	1996	1997	1998	2000	1995	1997	2000	2000
Never	46.43	22.60	16.00	14.52	3.77	46.03	32.35	4.76	3.03
Seldom	3.57	15.07	18.00	17.74	1.89	4.76	14.71	2.38	3.03
once in a while	10.71	20.55	21.00	24.19	16.98	4.76	13.24	23.81	—
Often	—	10.96	8.00	22.58	18.87	—	8.82	9.52	3.03
Regularly	—	7.53	12.00	11.29	39.62	1.59	4.41	23.81	12.12
Daily	—	1.37	3.00	4.84	9.43	—	4.41	26.19	78.79
no answer	39.29	21.92	22.00	4.84	9.43	42.86	22.06	9.52	—
N	56	146	98	62	53	62	66	41	33

Figure 1 shows the significant uptake in the usage of World-wide web browsers since 1995. Interesting, this figure also illustrates a levelling out in the use of the WWW since 1997 although the overall usage level of the WWW still remains extremely high.

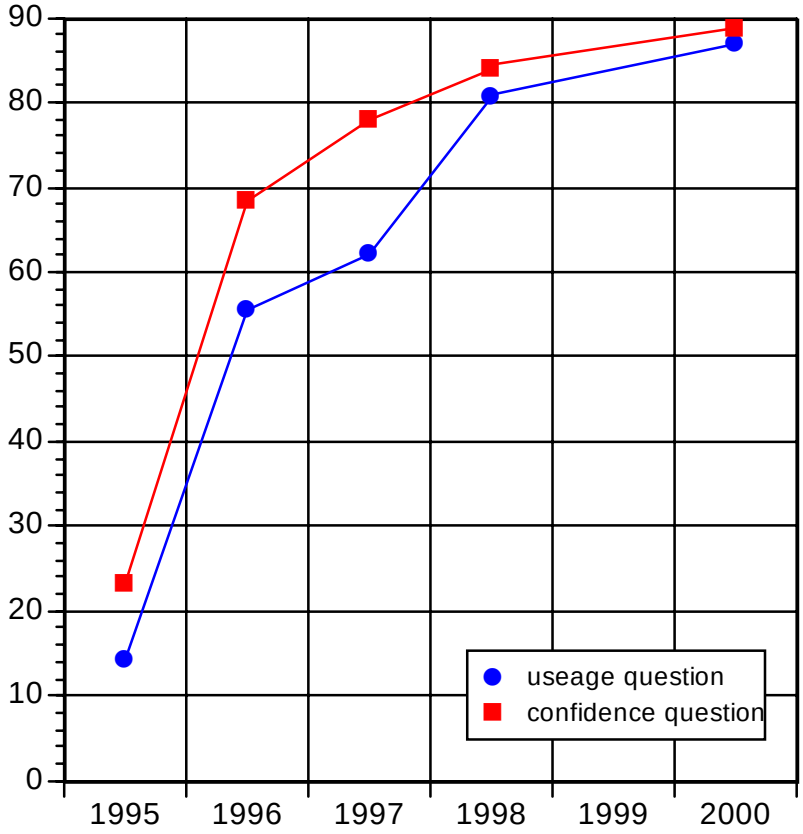

Figure 1. Uptake of World Wide Web Browser programs over time as expressed by internal students providing a positive answer.

Table 2
Internal Student's Usage of World Wide Web Browsers.
Breakdown by Gender

	1995		1996		1997		1998		2000	
	Fem	Male	Fem	Male	Fem	Male	Fem	Male	Fem	Male
Never	59.26	34.48	29.41	17.11	13.21	20.00	17.65	10.71	—	8.33
Seldom	—	6.90	14.71	15.79	20.75	15.56	20.59	14.29	3.45	—
once in a while	11.11	10.34	19.12	22.37	20.75	20.00	20.59	28.57	17.24	16.67
Often	—	—	8.82	13.16	11.32	4.44	20.59	25.00	24.14	12.50
Regularly	—	—	7.35	7.89	13.21	11.11	17.65	3.57	37.93	41.67
Daily	—	—	2.94	—	—	4.44	—	10.71	6.90	12.50
no answer	29.63	48.28	17.65	23.68	20.75	24.44	2.94	7.14	10.34	8.33
N	27	29	68	76	52	44	34	28	29	24

In terms of gender it is not possible to differentiate any trends in the usage of WWW browsers by the internal student population (table 2). On the whole, male students claim to be slightly more regular users—but this may well be the result of a male confidence bias inherent in the self-reporting method used in the survey. Among the external students (table 3), women tended to be less frequent users in the past, but this trend appears to have reversed in 2000. This result contradicts the more general finding of Mitra et al (2000) that men 'tended to use computers more than women'.

An assessment of the upbringing of the student (metropolitan, non-metropolitan city, rural) showed differences in all samples, but did not reveal any diachronic patterns.

Table 3
External Student's Usage of World Wide Web Browsers.
Breakdown by Gender

	1995		1997		2000	
	Fem	Male	Fem	Male	Fem	Male
Never	58.82	40.00	35.29	31.25	4.17	5.88
Seldom	5.88	4.44	17.65	12.50	—	5.88
once in a while	—	6.67	23.53	—	20.83	23.53
Often	—	—	14.71	3.13	8.33	11.76
Regularly	—	2.22	2.94	6.25	25.00	23.53
Daily	—	—	—	9.38	29.17	23.53
no answer	35.29	46.67	5.88	37.5	12.50	5.88
N	17	44	33	31	23	17

A comparison of the usage of WWW browsers between IT and Parks students in 2000 illustrates a significant difference between the two cohorts (table 1). IT students are more regular users of

the WWW with nearly 80% of students using it on a daily basis compared to less than 10% with external Parks students. This result is not surprising as IT students at CSU are required to access a majority of their course resources using a WWW browser. Even though it is expected that this differentiation between Parks and IT students will continue in the future; extrapolation of the expected usage by Parks students suggest that this gap will decrease over the next few years.

Confidence

The level of computer use is one measure of technological change and acceptance. However the extent of computer use does not fully reflect a student's ability to deal with the technology and the associated applications. An alternate approach is to investigate respondents' confidence when using such applications.

To measure their level of confidence, respondents' were asked to self rate themselves as to the type of user of computer technology they are. Respondents were given the option to select one of the following nine answer options: 'power user,' 'very confident,' 'confident,' 'comfortable,' 'uncomfortable,' 'a bit daunted,' 'very uneasy,' 'near panic,' and 'not yet used.' This approach might create a bias in the gender-specific responses, as males may be more assertive and positive in their responses than women; however the approach detailed is believed to be a good surrogate measure of their actual state of anxiety/confidence.

Statistical analysis (t-test) was carried out to compare between each of the annual averages for the internal and external populations respectively, as well as for the averages for 1995, 1997 and 2000 comparing the internal with the external populations. The average response (coded as 0 for 'not yet used' and 8 for 'power user') was calculated for each and plotted with their standard deviations as graphs to show the diachronic development of computer confidence.

Table 4
Confidence when using World Wide Web Browsers

	Internal Parks					External Parks			IT
	1995	1996	1997	1998	2000	1995	1997	2000	2000
Not yet	39.29	17.12	11.00	9.68	3.77	47.62	25.00	2.38	—
Near panic	—	2.74	1.00	—	—	1.59	1.47	—	—
Very Uneasy	1.79	1.37	2.00	4.84	3.77	1.59	4.41	—	—
A bit daunted	8.93	11.64	13.00	11.29	1.89	3.17	13.24	4.76	—
Uncomfortable	8.93	7.53	9.00	8.06	7.55	1.59	7.35	2.38	—
Comfortable	3.57	25.34	27.00	27.42	11.32	4.76	10.29	26.19	—
Confident	—	11.64	16.00	24.19	28.3	3.17	4.41	19.05	9.09
Very confident	—	6.85	7.00	8.06	26.42	—	8.82	35.71	21.21
Power User	—	1.37	3.00	—	9.43	—	1.47	2.38	69.70
no answer	37.50	14.38	11.00	6.45	7.55	36.51	23.53	7.14	—
N	56	146	98	62	53	62	66	41	33

Table 4 illustrates that over time both internal and external students became more confident in the use of WWW browsers (table 4). The average level of confidence of the internal students in using

World Wide Web browsers has shown a steady increase between 1995, when the average student was very uneasy, and 2000, when the average student felt confident (figure 2).

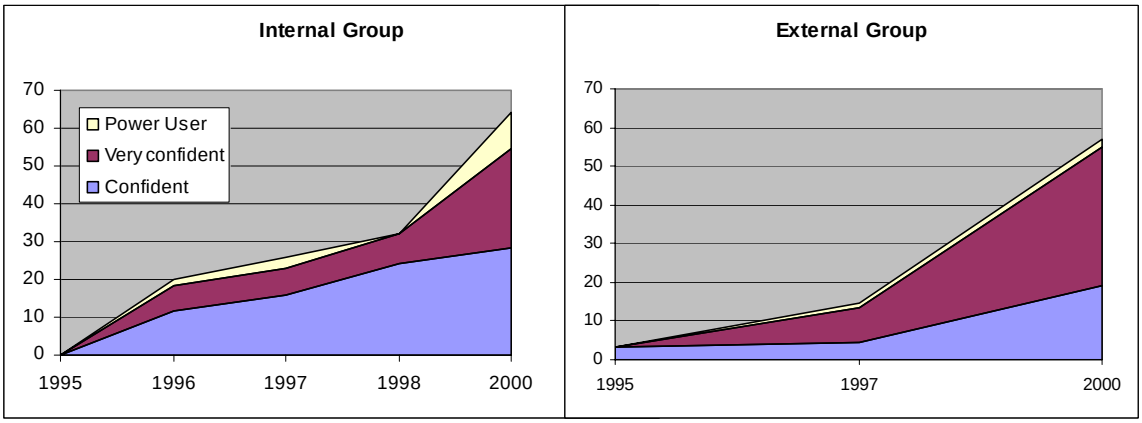

Figure 2. Internal group shows earlier development of confidence in web browsers

The curve had its steepest increase between 1995 and 1996, then plateaued out temporarily but increased again after 1998. The external student population also saw a steady increase between 1995 and 2000, although the linearity of that curve may be partially brought about by the fact that only three sampling points exist. The level in confidence observed for each year among the internal population increased significantly compared that of the previous year (ranges from $P=0.05$ to $P<0.001$). The same applies to the distance education body of the population (Spennemann & Atkinson 2002a).

As with many other applications assessed (Spennemann & Atkinson 2002a), more men than women claim to be confident in the use of the programs. This is more pronounced among the internal population (tables 5 and 6).

Table 5
Internal Student's Confidence when using World Wide Web Browsers.
Breakdown by Gender

	1995		1996		1997		1998		2000	
	Fem	Male	Fem	Male	Fem	Male	Fem	Male	Fem	Male
Not yet	48.15	27.59	20.59	14.47	16.98	4.44	11.76	7.14	—	8.33
Near panic	—	—	2.94	2.63	1.89	—	—	—	—	—
Very Uneasy	—	3.45	2.94	—	3.77	—	2.94	7.14	3.45	4.17
A bit daunted	14.81	3.45	8.82	13.16	11.32	15.56	14.71	7.14	—	4.17
Uncomfortable	7.41	10.34	11.76	3.95	11.32	6.67	8.82	7.14	6.90	8.33
Comfortable	—	6.90	19.12	31.58	33.96	17.78	29.41	25.00	13.79	8.33
Confident	—	—	11.76	11.84	7.55	24.44	23.53	25.00	37.93	16.67
Very confident	—	—	5.88	7.89	7.55	6.67	2.94	14.29	20.69	33.33
Power User	—	—	1.47	1.32	—	6.67	—	—	6.90	12.50
no answer	29.63	41.38	14.71	13.16	5.66	17.78	5.88	7.14	10.34	4.17
N	27	29	68	76	52	44	34	28	29	24

Table 6
External student's confidence when using World Wide Web Browsers. Breakdown by gender

	1995		1997		2000	
	Fem	Male	Fem	Male	Fem	Male
Not yet	58.82	37.78	17.65	34.38	—	5.88
Near panic	—	2.22	—	3.13	—	—
Very Uneasy	—	2.22	8.82	—	—	—
A bit daunted	—	4.44	17.65	9.38	4.17	5.88
Uncomfortable	—	2.22	14.71	—	—	—
Comfortable	—	4.44	17.65	3.13	25.00	29.41
Confident	—	4.44	5.88	3.13	25.00	11.76
Very confident	—	—	5.88	9.38	33.33	41.18
Power User	—	—	—	3.13	4.17	—
no answer	29.41	37.78	11.76	34.38	8.33	5.88
N	17	44	33	31	23	17

A regional break down of the internal students (table 7) shows that the confidence level of WWW use among rural students seems to marginally lag behind that of the metropolitan and non-metropolitan students. The same finding was indicated for e-mail usage (Spennemann & Atkinson 2002b).

The average responses between the Parks Management and the Information Technology Students (for the year 2000) were statistically very significantly different (*$P \leq 0.0001$!)* (see table 4 for responses). The reason for this difference rests in the fact that many of the subjects IT students undertake are only available using a WWW browser. This requires IT students to be very proficient with using such applications.

Discussion

This longitudinal study has shown that the level of usage of WWW browser software applications has increased from 1995 to 2000 among all students outperforming more traditional applications such as word processing and spreadsheets (Spennemann and Atkinson 2002a). This conforms to the overall expectations and trend in the growth of the WWW (Haynal 2000). Jackson et al. (2001) showed that male students were more frequent and more confident users of WWW browsers than females, whereas the roles were reversed in the use of e-mail programs. Our longitudinal study supports this observation for the use of e-mail programs (Spennemann and Atkinson 2002a), as well as for the use of WWW browsers in the *internal* cohort investigated. Among the external students, however, the gender trend seems to be changing, as more mature-aged women make use of WWW browsers and increasingly gain confidence in their use.

An examination of the WWW browser as well as of other applications (word processing, spreadsheet etc) shows a correlation between the frequency of use and the level of confidence with which they are being used (Spennemann & Atkinson 2002a). A comparison of the environmental student population with that of the IT cohort shows that IT students are much more

regular users of the WWW. This can be directly related to the requirement to use a WWW browser as the means of accessing the majority of teaching and learning materials. Likewise, the confidence in using the software is greater among IT students. This suggests that forced use of WWW browsers leads to more regular use of such browsers, which results in greater confidence among the users.

It can be posited that this in turn may increase the use of the applications for non-teaching/learning related aspects.

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