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ABSTRACT

This paper argues that individual differences among undergraduate students are important factors to the effectiveness of asynchronous learning and that students' needs and perceptions must be taken into account in the design of Web-based instruction (WBI). A student typology is presented based on evidence from an ethnographic study of a WBI undergraduate course in the Education program at the University of Alberta. "EDPY202: Technology Tools for Teaching and Learning" is philosophically based on the perspective that learning is a process of constructing knowledge rather than a process of recording knowledge. Although EDPY202 is primarily a software tools literacy course, it does provide the students with some exposure to curriculum integration. Qualitative data were collected from an EDPY202 class with an enrollment of 700 students between September 1998 and June 1999. A total of 116 students volunteered to be interviewed. The great majority of the students, 72, were 19 to 24 years old; 28 students were 25 to 35 years old and 16 were over 35. The method used to investigate the course relied in part on participant observation and in-depth interviews in order to construct the categories through which the participants themselves interpreted their experience. The majority of students interviewed liked the course and spoke positively about the self-directed, active learning experience. Results are discussed in terms of: developing a new vocabulary; written versus spoken communication; difficulty with active learning; feelings of isolation and exclusion; overcoming technical problems; and marking criteria. (Contains 13 references.) (AEF)

Developing a Typology of Students in a Web-based Instruction Course

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Abstract: This paper argues that individual differences among undergraduate students is an important factor to the effectiveness of asynchronous learning and that students' needs and perceptions must be taken into account in the design of Web-based instruction (WBI). A student typology is presented based on evidence from an ethnographic study of a WBI undergraduate course.

Introduction

The Faculty of Education at the University of Alberta requires that all undergraduate students be prepared to integrate the use of technology into the curriculum. In 1997 we began to redesign *EDPY202: Technology Tools for Teaching and Learning* (http://www.quasar.ualberta.ca/edpy202) to provide undergraduate education students with the basic skills they will need to apply information technology in Kindergarten - Grade 12 schools. At the same time we were designing this course, the Government of Alberta published *Information and Communication Technology, Kindergarten to Grade 12: An Interim Program of Studies* (Alberta Education, 1998), which formed the basis for the provincial program of studies that was implemented in September 2000.

This technology curriculum provides a broad perspective on the nature of technology and its impact on society. Students are encouraged to grapple with the complexities, as well as the advantages and disadvantages, of technologies in our lives and workplaces. It is not intended to be taught as a stand-alone course but rather to be infused within existing courses. Activities, projects, and problems that replicate real-life situations are effective resources for learning technology. (Alberta Education, 1998).

Since our graduates need to implement this curriculum, the expectations and philosophy provided in this document helped to guide development of our course. Although EDPY202 is primarily a software tools literacy course, it does provide the students with some exposure to curriculum integration. Thus, we hope that these soon-to-be teachers will be in a position to assist their students in using the information technology tools that are commonplace in modern society.

This paper reports some of the results of an ethnographic study of EDPY202 and proposes a student typology that can be relevant for designing and developing WBI courses and increasing students' satisfaction and performance.

The Course

EDPY202 is philosophically based on the perspective that learning is a process of constructing knowledge rather than a process of recording knowledge (Harel & Papert, 1991). From this perspective students are required to be "active participants" in their own learning, which implies substantial learner freedom to select learning strategies. To support this perspective we have designed the course to be self-paced with varying degrees of individualization, allowing students a higher level of flexibility with respect to course time commitments and the level of skills and knowledge they wish to achieve. Course materials can be studied individually, in collaboration with peers, or in collaboration with a more knowledgeable assistant. Further, we have focused learning activities on software tools used for problem-solving: Jonassen's (1996) "Mindtools." This emphasizes students learning "with" the computer as opposed to "from" the computer enabling students

to enter an intellectual partnership with the computer in order to access and interpret information, and organize personal knowledge.

The objectives for EDPY202 are directly related to the Alberta Education Program of Studies and students are required to complete either an introductory or an advanced module in each of five topic areas:

- Internet Tools (Email, Web-based conferencing, Internet searching, FTP, Telnet, Simple WWW page creation),
- Digital Media Processing (clip art, drawing, painting, scanning, digital photography, digital audio/video),
- Multimedia/Hypermedia Presentations: (PowerPoint or HyperStudio),
- Spreadsheets (e.g. Excel), and
- Databases (e.g. FileMaker Pro, Access).

While EPY202 has been designed to be self-paced and modularized with a focus on independent study, three optional face-to-face lectures are given to familiarize students. The material covered in the lectures is also available on the course Web page.

Although students are encouraged to work at home, a 3-hour/week laboratory period is assigned where each student has access to equipment (computers, scanners, digital cameras, etc.), software and face-to-face help from an instructor or a teaching assistant. This has two major results: firstly, many students appreciate the opportunity to take the course wherever and whenever they wish, and secondly, the teaching assistants in the lab can concentrate on helping those students who really need help. A comprehensive description of the course is covered in Montgomerie, Carbonaro, Davies and Medici (1999).

The Ethnographic Approach

Anthropologists originally used ethnographic research to study primitive cultures. The technique has been adapted to study organizational culture, which is defined as patterns of shared values, and beliefs that, over time, produce behavioral norms adopted in solving problems (Hofstede, 1990; Owens, 1987). Similarly, Schein (1990) noted that culture is a body of solutions to problems that have worked consistently and are taught to new members as the correct way to perceive, think about, and feel in relation to those problems. The sum of these shared philosophies, assumptions, values, expectations, attitudes, and norms bind the organization together. Organizational culture, therefore, may be thought of as the manner in which an organization solves problems to achieve its specific goals and to maintain itself over time (Hofstede, 1990). In this study we examine the alternative delivery class as organizational culture.

Method

Qualitative data were collected from an EDPY202 class with an enrollment of 700 students between September 1998 and June1999. A total of one hundred and sixteen students volunteered to be interviewed. The group of students was composed of 62 females and 54 males. The great majority of the students, 72, were 19 to 24 years old, 28 students 25 to 35 years old and 16 students were over 35 years old. A subsequent analysis showed that students with lower final course marks were over represented in this sample. The course the following sources of information and insight were drawn upon:

- Knowledge of the course and the students stemming from researchers' participant observations and as instructors.
- On-line discussion on the Web-board conferences and evaluation issues both as an integral part of the course.
- Students' e-mail messages to the researchers.
- Students' responses to open ended taped interview.
- Instructors' responses to open ended taped interview
- Teaching Assistants' (TA) responses to open ended taped interview

The method used to investigate the course relied in part on participant observation and in-depth interviews in order to construct the categories through which the participants themselves interpreted their experience. This

paper concentrates on students' point of view. Summaries of the students' comments on the course proved a valuable source of insight to develop a student typology and improve the course design.

Findings

The majority of students interviewed liked the course and spoke positively about the self-directed, active learning experience. One younger student who was quite adept at using computers before entering the course summarized the experience: *"I think this course is fun. It's a breeze. The [Web] site is cool. I am pretty comfortable with all software. The TAs are great. I can do all these things – no problems."* A mature, single parent identified a specific benefit: "*I like this course. I don't need to be on campus; I can be at home with my two year old boy and work on the modules at the same time. It saves me time and money – I don't need to find a baby-sitter.*"

About 30% of the students who were interviewed found difficulty with the course. An initial question probed the participants' experiences in the course up to that point. The students' reaction varied great deal. Some reactions were very apathetic, some were very positive, and others were very negative. In telling the stories of their learning. Participants reflected upon the nature of their involvement with EDPY202. They detailed their experiences as they received their initial information about the course, and their development thorough the course.

Developing a New Vocabulary

Some students come to EDPY202 course with no computer literacy. The acquisition of a technology vocabulary is a fundamental part this course. The EDPY202 Web site provides an on-line glossary of all computer terminology used in the course. One male student, 24 years old, attending Secondary Education program exemplified this problem: "*It's so overwhelming... I have to learn [how to use] the Web site and there are so many new words, computer terminology... Searching the Internet is so frustrating... I never get the er choose the right words.*"

Written Versus Spoken Communication

Students are encouraged to use e-mail for communicating with instructors, teaching assistants and classmates. Although students did use e-mail many of them still preferred face-to-face interaction. One female student, 22 years old, attending the Elementary education program said: *"I express myself better talking than writing.... In a distance situation I prefer talking on the phone. It saves time. In this course I have to write e-mails when I have problems... I have to wait for answers that usually don't help much."*

We set up a *WebBoard* Web-based conference system (O'Reilly Software, 1999) to allow students to discuss course topics. During the first two weeks of the course they posted about 234 messages. However this volume was not continued throughout the term. Messages dropped dramatically as some of the students said that they did not read other students' postings because they though they were useless. One female student, 20 years old, attending the Secondary Education program said: *"I have difficulty expressing myself. I don't have much knowledge about computers... I don't know how to give smart or relevant contribution to the Web-Board. So, I don't use it...I don't go there...It doesn't help me... I don't waste my time reading it."*

Difficulty with Active Learning

Although students had access to both a lecture and a Web page that explain active learning in detail, some students are unable to accept and internalize the process of searching and constructing their knowledge. One male, 45 years old, attending the Secondary Education program stated: *"I need to be taught. After I can do*

things [by] myself. I don't like classes [where] I never see the instructor. The TAs don't know everything. I just can't stand it. It is not my style... I am to old to change now." Another showed frustration and lack of understanding: *"In the e-mail the instructor told me I must be responsible for my own learning, but what does it mean? I am a responsible person.* A female student, 20 years old, attending the Elementary Education program: " *I don't understand active learning. I am going to teach in a traditional way. I am in elementary. I* " A male student, 23 years old, attending the Secondary Education program: *I am not an independent type of person. I need help to learn.*"

On the other hand, some of the students had more positive reaction and they were very optimistic about active learning. A female student, 24 years old, a Secondary Education student explains: " *I always have been very independent since school. I take this course from home...I don't think I learned how to be independent. It is just the way I am. I don't know if am practicing active learning in this course, but at least I am trying.*"

Feelings of Isolation and Exclusion

Students who feel any kind of disadvantage may be affected by their perception of the group norms. Inevitably these students compare themselves with the group in terms of achievement. The impact of this mindset may be so strong that some students may drop the course. A female student, 19 years old, attending the Elementary Education program said: *"The others are so smart. They talk differently, they know what is going on...they know that stuff... I just learned how to turn it [the computer] on. It is awful."* A male student, 23 years old, attending the Secondary education program said: *"I feel isolated and in disadvantaged because I am slow... My TA doesn't have the patience to explain things to me. He always says I should know how to do things by now but I forget stuff after a while... I have to graduate... I have to pass."*

Overcoming Technical Problems

The level of anxiety for some students is quite high, mainly at the beginning of the course. One of the most common reasons given is problems encountered with the technology. One male student, 22 years old, attending the Secondary Education program reported: *"I want to drop out but I can't. This is a required course and I Nothing seems to work for me.... The computer doesn't like me. It crashes on me all the time. I lose my work and I have to start all over again.... It is a waste of time."*

One often reported problem is that the laboratory which students use is equipped with Macintosh computers. Some students who use Windows computers say the Macintosh interface confuses them. They feel disadvantaged because the examination takes place on Macintosh computers. A male student, 20 years old, attending the Elementary Education program reported: *"They told us that we can take this course from home... it's not true. I'm an IBM user... I have to come here [university] for the final...they have only Macs... It's not*

Marking Criteria

Some students perceived problems with marking criteria. One female student, 32 years old, attending the Secondary Education program: *"If you don't do the advanced ones [modules] you'll never get a good grade. So, why are the intro modules there? You have to do the advanced [modules] anyway."* Others found the system of submitting their assignments for marking via the File Transfer Protocol (FTP) and the automated system, which kept track of submissions (Montgomerie, Harapnuik & Palmer, 1997) to be very frustrating. A male student, 25 years old, attending the Secondary Education program: *"First my password didn't work... now I never get my marks back on time, I sent messages to my TA but he never answered me."* Another said, *"I always lose something [files] when submitting assignments. How can I prove I did it on time? I lose marks! The TA can't be responsible but I would like to be able re-submit the stuff and get my marks."*

Developing a Student Typology

During the observations and interviews we have had the opportunity to identify individual differences in students' perceptions, behavior, and learning styles. In discussing their expectations of their EDPY202 experiences, students provided large amounts of information about their understanding of themselves as learners. They discussed the ways in which they feel more comfortable learning and presenting assignments. A male student, 22 years old, attending the Secondary Education program said: "*I have been dealing with computers since junior high. It is not a problem. I know all that stuff already. I hope I can get a nine.*" A female student, 32 years old, attending the Elementary Education program said: *"I feel comfortable in the traditional classroom. Computers frighten me a lot. I always think I can do something wrong. I don't have much confidence in me or in what I can do in this course.*" She also indicated that she always feel excluded during the lab sections: "*TAs never look at me.*" She also felt embarrassment at her lack of knowledge in *I just can't explain what is going on because I don't know specific computer terminology* cited the excitement of learning through Internet and WWW and their worries with the completion of the course. A male student, 21 years old, attending the Secondary Education program said: "*This is a good experience. I can stay updated, I can learn faster. It drives me... to go on, eh. Now everything is on the Internet and I have to learn how to use it properly in the classroom. It is a revolution. I like the way this course was set. Even when I am getting tired and I don't feel like working on the course I realize. I'm getting behind and that's the motivation to move on.*" A female student, 42 years old, attending the Elementary Education program said: *I don't know exactly what I am doing in this course but I now the importance of the Internet, so let's see what happens. Well, I have to get credit too.*" Another student, a male, 26 years old, attending the Elementary *I now I need this course. I want to teach using technology. It is difficult sometimes, but not impossible. I am confident using the Internet. I can work on my own pace. I can learn... and I need to graduate, of course!*"

Students come to EDPY202 with very different expectations but with one thing in common they want to be successful. A female student, 21 years old, attending the Secondary Education program explains: "*I want to learn but I also want to pass.*" A male student 21 yeas old, attending the Secondary Education program sees himself as a very independent learner and he was expecting a interesting kind of course. He said: "*Oh gee! This is really interesting stuff, I was expecting something like that, well, what can I say... It is just great, lots of fun, eh!*"

This has led us to begin to develop a typology of students in this course. The first category of student is the Beginners. Beginners have little knowledge of the technology involved and appear to resist it because they are not fully aware of its implications and use. The challenge is to convince these students that technology can benefit their professional lives and their future students. The second category is the Skeptic. Skeptics are aware of the importance of the technology in their professional life but they are concerned about the amount of work required to develop the skills necessary to use the technology effectively. Skeptics often complain about the effort needed to complete the required tasks. The third category of student is the Explorer. Explorers are enthusiastic about the technology, have some previous knowledge and want to learn more. These students have a mixture of dependent and independent learning style and most of the time they are pleased to help others. A fourth category is the Optimist. Optimists have little knowledge but accept the technology at face value and want to learn as much as possible from TAs, instructors and peers. Explorers and Optimists are about 90% of the interactive learning community in the course. The final category is the Self Professed Expert. Self Professed Experts are very independent and never go to the lab sections. They often say they are taking the course only because it is required. Self Professed Experts appear to think they know everything and they don't need help from instructors, TA or classmates. Often, Self Professed Experts obtain the highest final grades in the class, but this is not always the case.

Conclusion

The findings of the study point to many factors that can influence students to have either a successful or a disastrous on-line experience. Looking at the Web course structure and its impact on the students, it is clear the importance of knowing what kind of students instructors have in their courses. Successful or problematic experiences have strong impacts on class relationships and consequently on students' performance and attitudes towards the course. Some of students with limited skills or knowledge feel like outsiders while other

students develop a friendly interactive group. Web-based course developers have to take into account students' differences if they want to design truly individual instruction. Without a Web-based course that takes into account students' individuality, students feel isolated and become anxious, defensive, and helpless.

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