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In this issue:

## Technical Classes Online: A Different Breed of Learning?

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# Technical Classes Online: A Different Breed of Learning?

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## Abstract

This paper describes the partial findings of a dissertation on distance education based on a case study at Farmingdale State College in New York. The study, **Online Threaded Discussions: Purposes, Goals and Objectives**, analyzed interaction from the standpoint of the instructor. Interviews were held with faculty and triangulated with analysis of "starter" discussion questions, database transcripts, and focus groups. One of the important findings of the study was that there was a major difference between online *technical* and *non-technical* classes. Technical courses in any discipline were seen as different. These differences affected the purposes, goals and objectives set by instructors for their threaded discussions. The differences also necessitated a different form of interaction. These findings can be used to develop best practices for technical instructors in a virtual classroom and members of the systems education community.

**Keywords:** distance education, technical courses, systems educators, interaction, online threaded discussions

## 1. INTRODUCTION

Threaded discussions have become standard fixtures in distance education. The technology is there to "talk" online and research has shown that the social and cultural environment created by this "talking" can be beneficial to online students. It can be useful in decreasing transactional distance problems and can help develop social relationships among students and the teacher. Social and interpersonal interactions directly foster content and instructional interaction (Liaw and Huang, 2000) and can play a key role in the learning process (Trentin, 2000). Social presence is also a good predictor of learner satisfaction (Gunawardena and Zit-

tle, 1997). Too much social presence, however, may actually be a detriment to learning (Rourke et al., 1999).

Fairly high levels of social presence are necessary to support the development of deep and meaningful learning (Rourke et al., 1999) and this "deep" learning is frequently not achieved or seen in analysis of class transcripts. Computer mediated communication may serve as more of a support system for other online activities (Guzdial et al., 2002).

Educational researchers have analyzed online interaction extensively. The results of countless online class transcripts and databases have been categorized, classified,

graphed and summarized. Researchers have critiqued the quality and quantity of student participation within these databases with varying results. Statistics on interaction and online threaded discussions abound. But what do they mean? How can we evaluate the good and the bad without first knowing the objectives, the goals and the purposes? What is an online threaded discussion's purpose? Information exchange? Social presence? Deep learning?

Faculty create the goals and objectives for their courses and curriculum. From these goals and objectives, they select the best strategies and tools to achieve them. The literature has ignored the most important component – the instructor. We need to know from a faculty standpoint, what the purpose of a threaded discussion is. What do teachers hope to accomplish from this teaching tool? Do these purposes, goals and objectives vary based on the particular course or discipline, student characteristics, or the teacher's approach to educational philosophy and practice?

Before a true and valid evaluation can be made of online threaded discussions (and other online tools), research must start at the beginning. Faculty must be contacted and interviewed to describe and detail just what they are trying to accomplish using these tools. It is only then that the results can be compared to the objectives. The recurring theme behind this study is that an evaluation cannot be made of an educational strategy or tool, such as an online threaded discussion, until the initial purposes and goals have been determined. This study seeks to understand the online instructor as a participant in a social process and cultural setting. In order to achieve these goals, this study took a qualitative research approach.

## 2. METHODOLOGY

This project utilized a case study approach at Farmingdale State in Farmingdale, New York. Farmingdale State closely parallels the statistical characteristics and profile of an institution offering distance education classes as presented by the U.S. Department of Education National Center for Education Statistics in its *2004 Condition of Education Report: Distance Education at Postsecondary Institutions*.

The first parallel characteristic is the amazing growth of Farmingdale's distance education program. Other parallels include the fact that Farmingdale State is a public college that offers both two and four-year degrees. Further, the college offers online classes in addition to traditional face-to-face classes and students taking classes online generally also take face-to-face classes at the same time. Both technical and non-technical classes are offered as well as upper and lower-level undergraduate courses. No graduate courses are offered.

### 2.1 Pilot Study

Online faculty interviews constituted the major methodology used in the study. A pilot study was conducted to test the interview script and the mapping of the interview questions to the research questions and objectives. The pilot study also sought to find any apparent differences between Farmingdale State online faculty and faculty from other colleges.

Three business teachers were interviewed: one from Briarcliffe College, one from Five Towns College, and one from Farmingdale State. The interviews were taped and then each interview was transcribed into a Microsoft Word document using an interview transcription template created for this purpose. Faculty responses on the transcription template were then transferred to a mapping document of research questions and objectives. Individual mapping documents were compiled into a summary document and analyzed.

### 2.2 The Main Study

Thirty-six Farmingdale online faculty met the criteria for interviews in this study. All thirty-six were invited to participate in the project. Thirty were ultimately interviewed. Of the thirty faculty members interviewed, four were adjuncts and twenty-six full time. Teaching experience in the *face-to-face* traditional classroom ranged from one year to thirty-seven years. Farmingdale has a low faculty-turnover rate. Most of their full time teaching faculty have been there for many years. The use of adjuncts has increased over the past ten years. Few full-time faculty have been hired during these ten years.

*Online* teaching experience ranged from one year to nine years. The SUNY Learning Net-

work online program has been in place at Farmingdale for seven years. Anyone with over seven years online experience taught online at another school previously. Most instructors continue to teach the same classes online year after year. More online classes are being offered every semester. Teachers for these new online classes are recruited first from the existing full time faculty.

The script for the interviews was the same script used during the pilot study. The script was found to be appropriate and manageable for the purpose of data collection and analysis. As with the pilot study, the interviews were taped or notes were taken based on the wishes of the interviewee. The interview was then transcribed to a Microsoft Word transcript template. The transcript was transferred to a document that mapped the interview questions to the research questions and objectives.

### **2.3 Analysis of Starter Questions and Databases**

During the interviews, the interviewees were asked to permit the researcher access to the online discussion threads of their classes or to provide a list of "starter" questions utilized by the instructor. The analysis of these "starter" questions and the databases served to provide triangulation for the research study.

The starter questions and databases were analyzed simultaneously with the interviews. The face-to-face interviews revealed what the instructor hoped to accomplish. Analysis of the instructor's "starter" questions or the actual class database transcripts showed if the instructor actually did what he or she set out to do. This comparison served as a form of triangulation.

The actual questions from the list provided by the instructor or from the actual database transcripts were analyzed using Engeström's (2002) Two Models of Learning and Ngeow and Yong's (2003) Learning through Discussion Model.

Engeström (2002) described two models of learning. Model A provides tasks that focus on learners finding correct solutions and fixing false ones. Model B provides complex tasks where solution ideas and their justifications will vary. Model B learning is focused

on principles of the task and solutions are achieved by comparing, arguing, and debating. There are no standardized answers (Engeström, Engeström and Suntio, 2002).

Ngeow and Yong (2003) categorized discussion tasks into four areas: 1. Guided Discussion Task; 2. Inquiry-Based Discussion Task; 3. Reflective Discussion Task; and 4. Exploratory Discussion Task (Ngeow and Yong, 2003). Within these four types of discussion tasks are successive stages of instructor direction, student involvement and degree of participation, responsiveness to other students, problem solving and critical thinking skills. Each question posed by the online teacher within the threaded discussion was categorized using both methods and the results entered in a table. Data from the interviews and the analysis of the starter questions and database transcripts were synthesized and integrated.

### **2.4 Focus Groups**

Three focus groups of online faculty from private colleges in the area were then convened to compare and/or validate the outcomes from the other data gathering techniques. The data derived from the initial interviews and document observations were used as discussion start up points for the focus group.

### **2.5 Second Interviews**

Further, during the Farmingdale interviews, it was noted that several of the Farmingdale faculty also teach or have taught online at other colleges. Follow up sessions were conducted with five of these faculty members to confirm conclusions about recurring themes and integration with both the previous data and literature review.

## **3. RESEARCH QUESTIONS**

The main research question was: What are the purposes, goals and objectives set by online instructors for the utilization of threaded discussions? Five sub questions branched out from the main research question:

1. How does faculty evaluate the success and value of online discussions?
2. Are threaded discussions valued for social or cognitive purposes or both?

3. Do instructor characteristics influence the purposes, goals, and objectives of online threaded discussions?

4. Do student characteristics (age, gender, ability/intelligence, maturity/life and work experience) influence the purposes, goals, and objectives of online threaded discussions?

5. Do academic discipline and the educational level of students affect the purpose and objectives set by the instructor for threaded discussions within online courses?

All five sub research questions were paralleled by objectives to be achieved during the investigation. Since this paper is concerned mainly with research question number five, only the objectives relating to that question are shown below:

- Determine how classes perceived as "technical" may affect the instructor's objectives and goals for online threaded discussion from the standpoint of cognitive presence, social presence and teacher presence.
- Determine how lower-level (freshman or sophomore) classes affect the instructor's objectives and goals for online threaded discussion from the standpoint of cognitive presence, social presence and teacher presence.
- Determine how higher level (junior or senior) classes affect the instructor's objectives and goals for online threaded discussion from the standpoint of cognitive presence, social presence and teacher presence.

**4. INTERVIEW RESULTS**

Twenty-seven percent of the instructors described their classes as technical. Fifty percent described their classes as non-technical and twenty-three percent stated that they taught both technical and non-technical online classes. (See Figure 1). Technical was described to the instructors as defined in this study as a course that is devoted to learning a specific skill.

Thirty-three percent of the instructors taught only upper-level classes, thirty percent taught only lower-level classes, and thirty-seven percent taught both upper and lower-level classes. (See Figure 2).

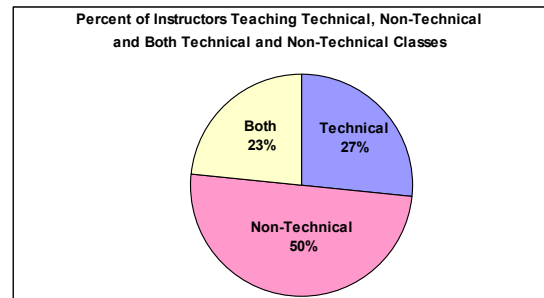


Figure 1: Instructors Teaching Technical and Non-Technical Classes

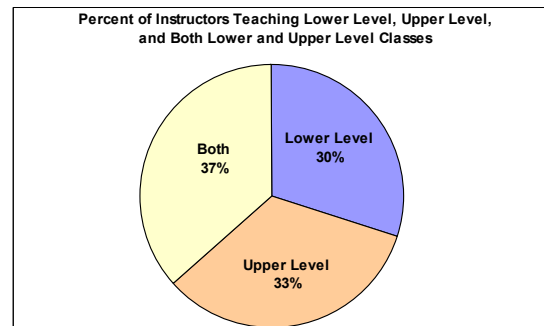


Figure 2: Breakdown of Upper and Lower-level Classes

There appeared to be no pattern or relationship between level and technical nature of the class. Just as many lower-level classes were rated as technical as upper-level classes. There was also no apparent relationship between the level taught and faculty profile.

Although this paper is mainly concerned with differences between technical and non-technical courses, some of the major overall findings of the study are described below. This sets the stage and permits visualization of the notion of "technical" within the context of the overall study.

Goals, as defined in this study, represented the highest level aim, being broad, general, intangible and abstract. Stated goals were generally of a social and of cognitive nature.

The term "objectives" as used in this study denotes a more specific aim used to support or achieve the expressed goals. Due to the varied content and discipline of the online courses, these objectives were somewhat varied. A common theme was to develop an awareness of ethical and moral issues involved in the particular discipline. A business student might be expected to consider ethi-

cal issues in dealing with foreign countries that support terrorism, bribes, etc. A computer student might be expected to assess the issues involved in loss of information confidentiality or software piracy.

Many instructors specified using discussions to reinforce the readings from the textbook. Frequently mentioned factors involved carrying over the textbook to the real world and providing further insight into the topics covered. Some said that students get better grades if they discussed the topic online after reading about it in the textbook. Other instructors stated that not all points were covered in the textbook or readings and that threaded discussions could be used to cover these topics. Along these same lines, keeping the course current was mentioned frequently. Online courses are generally designed and created totally before the start of the school year. Making revisions within the semester is not always feasible. Spur of the moment changes easily accomplished in a classroom are not readily achieved online. Online threaded discussions can be used to introduce current topics or happenings that have occurred after the start of the school year and after the course has been created and designed.

One computer security instructor described his attempts to keep current:

"By the time we get a textbook, it is old and everything is wrong. My field changes daily and instantly. By the time the students actually take the class, it is outdated. I have found that the online discussions can be used to bring in the new material and let students know what is no longer being used out there."

#### 4.1 Faculty Perception of Success

Forty-seven percent of the instructors (14 out of 30) stated that they considered their online discussions successful. Within this grouping, many instructors expanded on the term "successful" either qualitatively or quantitatively. Five added the word "very" to successful and described why they felt the discussions were successful. These comments included:

"Students interact and talk to each other."

"A sense of community is created."

"Students help each other and the discussions reinforce textbook and lecture material."

"It does a good job replacing class participation."

"It keeps the students awake and participating."

"It provides a way to evaluate student progress."

Two out of the fourteen instructors stated that they would rate the discussions in the eighty to ninety percent range and that this was the same as in their face-to-face classes.

Not all qualifications of the term "successful" were positive. One instructor stated that success means "good" not "excellent". Three other instructors stated that discussions were only successful when the topics were interesting and relevant to the students and that there is never one hundred percent participation.

Twenty percent (6 out of 30) stated that their online discussions were not successful. Four stated that the students "did not do it" and did not interact. The fifth instructor stated that at best he had fifty percent participation and that was in a better class. The sixth instructor stated that, "It is always the same. Students participate somewhat in the beginning of the semester and then just stop doing it."

The remaining ten instructors (33%) evaluated their online discussions as less than successful but not quite unsuccessful. Eight instructors used the term "fair", "not bad", or "not that good." Three quantified their answer stating they would rate them as six or seven on a scale of ten. Two other instructors stated that "sometimes" the discussions were successful for "some" of the students. This theme was reiterated by virtually all of these ten instructors. They stated that some classes were better than others, but that some students just do not participate, and others do only the minimum or post late. A typical comment was, "'A' students have a lot to offer in the way of participation and want to do so. Less than 'A' students do not have as much to offer and ESL students do not participate at all."

Four of the instructors in the “fair” category did state that they considered the online discussion rating to be similar to that found in their face-to-face classroom discussions. Others stated that the particular topic of the conversation had more to do with determining success and that the topic must be interesting to the students. Some instructors stated that they found it hard to find topics to discuss in their classes because of the course subject matter. Other comments were that discussions were successful if there was *not* a lot of other work assigned during the module. The amount of work involved in participating was mentioned often.

Setting goals, whether social, cognitive or both, did not always bring about success. Faculty perception of the success or lack of success in their online threaded discussions is shown in Figure 3 below.

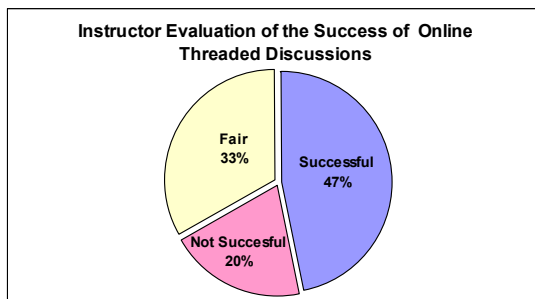


Figure 3: Instructor Evaluation of Online Threaded Discussions

### 4.2 Deep Learning

Cognitive or learning skills were mentioned frequently during the interviews. Learning skills referred to a variety of factors from learning to communicate in a professional manner to writing effectively to problem solving abilities. Deep learning and critical thinking skills were referred to less often. When faculty were asked if they thought deep learning could be achieved through online discussions, seventy-seven percent (23 out of 30) stated yes. When asked if it was happening in their online discussions, however, only forty-seven percent (14 out of 30) said yes. Of this forty-seven percent, there were many qualifying comments such as “rarely”, “only in a full-length course”, “only by some students and to a certain extent”, “only for some topics” and “only when I poke, prod, and make them show analysis, value appraisal and links to real life.”

When asked why they thought deep learning was not happening in their online discussions, typical comments were:

“Online discussions are about chatting in class. They are not heavily researched conversation or documented in any way.”

“Students are not experienced or interested in the topic.”

“There is not enough student input and no conflict.”

“You do not see deep learning at this level. You see it at the graduate level.”

“Deep learning occurs from the assignments, not online discussions.”

“Learning is achieved, but not deep learning. I doubt if it is retained when the class ends.”

“My students are superficial. They can’t write and they can’t analyze.”

“My students are not critical thinkers.”

“This course is mandatory and they do not put forth enough effort.”

“My students do not have the maturity and are not interested”

There were a few positive comments such as:

“This class plants a seed in students and provides the foundation for lifelong study in their careers. I see them several years later and they have retained the knowledge from my class.”

When asked how they evaluated whether deep learning was happening in their classes, most instructors stated that they looked at student responses. The deep learning comments were next viewed against the social and cognitive goals set by instructors. The fact that an instructor felt a social or cognitive goal was more important seemed to have no influence on their feelings about deep learning. Forty to fifty percent of all instructors stated that deep learning was not happening in their online discussions no matter what the goal. In fact, those instructors that stated *cognitive* goals were most important found less deep learning than the other two categories. (See Figure 4).



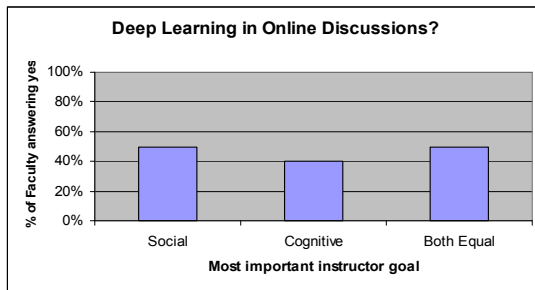


Figure 4: Evaluation of Deep Learning in Discussions

### 4.3 Instructor Characteristics

Comparisons were made of the purposes, goals, and objectives set by instructors and number of years total teaching, number of years teaching online, gender, participation by the instructor in the online discussion, procedures used to encourage/demand participation, and whether the instructor combined discussions with other learning activities.

There seemed to be no real connection between the goal selected and number of years teaching face-to-face. When looking at years experience teaching *online*, the goals selected did not seem to be related to number of years of online teaching. Gender seemed to have no connection to goals. The training provided did not seem to have any effect on the instructor’s choice of goals or perceived success.

### 4.4 Student Characteristics

Instructors continually described their classes as “diverse” and composed of young and old, academically “weak” and “strong”, mature and immature, experienced and inexperienced. They stated that online classes are more diverse because they combine the evening school students with the day school students and also may include students from other SUNY campuses across the state. It was mentioned that there is no “middle” in the class and no “target” to teach to.

It was also mentioned frequently that the class composition changes all the time. Some classes produce outstanding work and participation. Other classes with the same instructor, course, and teaching methodology do not.

The consistent finding was that this individual and collective diversity very much affect

the results of the online discussion. The diversity does not affect the purposes, goals and objectives set by the instructors. They create the online course in advance and do not know what the students will be like until the course is underway. Virtually all instructors stated that they do not change an online course once started.

### 4.5 Academic Discipline and Educational Level

Academic discipline and the nature of the course taught were often mentioned as factors that could affect the quality of class discussions. When asked the best courses for online discussions, the typical answers were liberal arts and humanities courses such as literature, philosophy, history and psychology. The worst courses mentioned for discussions were math classes such as calculus and statistics and business/programming classes such as accounting or database. Comments included, “What do you say about fractions?” “What do you talk about in accounting?” On the other hand, a statistics teacher and an accounting teacher were interviewed and both gave very positive evaluations of their class discussions. These two instructors, as well as several others, stated that it is not the course but the question that is important. The topic must be of interest to the students, whether it is accounting, literature, or math. Finding topics that are interesting to students may be more challenging in some disciplines than others and this was mentioned in a number of the interviews. Instructors in the Arts and Sciences were more likely to consider their discussions successful than instructors in other disciplines.

## 5. TECHNICAL CLASSES

“Technical” classes were seen as unique and different than other classes in the study. It was the most significant distinction made when discussing online threaded discussions with faculty and when analyzing source documents.

### 5.1 The Focus and Objective of the Course

What is it that makes a technical class different? As stated previously, technical was described to the instructors as defined in this study as a course that is devoted to learning a specific skill. The learning of this specific

skill is the main focus and objective of the entire course. Students are immersed in "doing" or "making" as opposed to building a general knowledge foundation. Offline, these classes may not even be taught in a classroom. They may be taught in a laboratory of some type. Offline, these classes may not even have a class discussion or participation component. Demonstrations and tutoring may be required and may not be available online.

Does moving the technical class online, change the nature and focus of the class? The majority of the instructors seemed to feel that it did, but that they did not necessarily see this as a detriment to the course or learning outcomes. There was, however, concern. Were students being moved from active learning to passivity? There was no agreement about whether talking about a topic or activity is important as actually being able to perform that activity.

### **5.2 Discussion Topics: What to Talk About?**

Technical instructors mentioned the problem of finding appropriate topics to discuss and stated that discussion takes away from the time needed for the real objective of the course – learning to make or do something. Some instructors used online discussions to look at current trends and events in industry. Others stated that some students thought of these discussions as "busy work" that takes time away from what they are supposed to be doing. These students participated only because the discussions were mandated and part of the course grade.

### **5.3 Student Time Constraints**

Some instructors stated that the addition of online threaded discussions to a hands-on course increases the amount of time students must put in to complete the course requirements. An alternative is to shorten the time allocated to hands-on activities. Instructors worried that this may unfavorably affect successful achievement of the original objectives and learning outcomes of the course.

### **5.4 Time Delay**

In a liberal arts course, a delayed response from the instructor of a few days may not be critical. This may not be the case in a tech-

nical class. If a student is required to complete a project or program at home and runs into a problem, a delay of several days in contacting the instructor and finding the solution may be critical. A minor correction that can be made by a "live" instructor in minutes may require days to correct online.

### **5.5 Time Constraints of Instructors**

Other faculty concerns related to the time required for instructors of technical courses. If time lags are more important in a technical class, does this mean that the instructor needs to be accessible more often? Are synchronous meetings online necessary? Must the instructor have fixed office hours? Is it fair to require an instructor of a technical course to be more available than a non-technical instructor?

### **5.6 Additional Requirements**

Online technical courses may require students to have specific software programs or equipment at home. Not all students may have this equipment or software. Students must be able to successfully load and set up this equipment themselves. Frequently, the instructor must allow additional time at the start of the semester to accommodate this equipment/software installation. If there is a problem with the installation, the student may not be able to complete or even start the online course. There may or may not be a school lab available (local student) or other option available (distant student).

Further, can the results of the technical activity be transferred back and forth between teacher, student and other students? Will everyone have access to them?

### **5.7 Interaction Shift**

Current literature, including this studies itself, points to the need for and benefit of group and social interaction. Yet, the instructors pointed out that technical classes may have different needs in this area.

The need for more one-on-one student-to-teacher interaction was reported by most technical instructors. Others stated that some students need more one-on-one interaction and some don't need any. Some students "just get it" and do not have to talk about it.

Group interaction, if there is any, more often revolves around one student asking others for help. How does this change the social dynamics of the class? Are stronger students willing to help and provide scaffolding for the weaker students? Is this even possible in a technical class?

The instructor and the students have limited time. If there is an abundance of one-on-one discussion with some students, there may be less time to devote to other students or to the class as a whole. This can be a problem. Online students want to be part of a social class environment as well as connected to the instructor.

### **5.8 Administrative Concerns**

Can the administration require teachers of technical classes to have different workload requirements than other teachers? Can the size of the class be altered based on the nature of the course? If the course does require changes online, how does that impact the same courses taught in traditional classrooms or labs? How does that require modification of the curriculum in other classes?

Lastly, one instructor stated that not all courses are suited to the online format. In particular, he mentioned a course in UNIX, a computer operating system. Others mentioned that they felt it was the online discussion that kept their classes from becoming correspondence courses.

## **6. CONCLUSION**

What implications does this have for online technical as well as non-technical instructors? Online instructors may need to rethink their learning strategies and methods if they hope to achieve success in the goals they set. Individual learning activities may need to be turned into group or social activities. Online class management systems permit public viewing of all documents. Individual assignments of any type from a programming project to a financial spreadsheet can be shared with the whole class. Breaking up a programming assignment and assigning each student a part of it may promote more social and cognitive learning online than having the student construct the entire program alone. Instead of research papers, or in addition to them, instructors might try role playing or debates on issues and topics relevant to the course. The use of Delphi

techniques may work well since it involves developing a consensus among the participants and this can be readily achieved online anonymously. Case studies have been shown to work well and can be applied to many fields outside of business and economics. Social or collaborative activities may also increase interest when the topic is not particularly exciting to students, but still must be covered as a part of the curriculum.

Another practical issue mentioned was the amount of time needed for reading and responding to discussion entries. Students do not respond if they are overwhelmed with other class work. Discussions in the classroom do not require additional outside work. Online discussions do. Instructors may need to modify online course activities and grading policies to reflect and account for this time issue. Combining the discussion with another learning activity may be a good solution. An online class is not exactly the same as a face-to-face class. The same books, activities and grading policies may not work.

The instructors in this study did not use threaded discussions to achieve teacher presence. This goal was either achieved in other areas of the course management system such as private folders or e-mail or not considered important. This seems unfortunate. If the instructors are developing teacher presence in other areas of the course, they are increasing their work load. Threaded discussions provide the ability to respond to all students simultaneously. Although certain issues need to be discussed privately, reinforcement and encouragement can easily be accomplished through the threaded discussions. Most student questions can also be answered in the threaded discussion.

Most instructors appeared to feel that by participating in the discussion they were keeping students from becoming "active" learners. Yet, in a typical undergraduate face-to-face classroom, an instructor would not ask a question and then sit down and let the students run the lesson. Some instructors want to have the comfort of the class participation genre, but they have changed their rules for participation once the course moves online in the name of "active" learning. Instructors need to find a better balance between participating to encourage and

challenge, yet still allowing the conversations to be student-driven. Further, being an active learner in the classroom may be easier than being an "active" learner online. The same clues are not there for the students. They may need more guidance and assistance in their quest for active learning.

Confusion about the nature of active learning may also point to a need for more teacher training based on educational pedagogy for online classes as opposed to training to use a particular course management system. Some instructors stated that they just did not know how to facilitate a conversation online and were uncomfortable doing so.

Time constraints for faculty are a valid concern. This was mentioned frequently during the interviews and the focus groups. Faculty may want to participate in the discussions, but do not have time to do so. Thus, they will not be able to achieve the goals they have set. Faculty schedules and work load should be modified as needed.

Class size may also be an issue. A physical classroom with forty students is not equivalent to a virtual classroom with forty students. A technical class requiring more one-on-one interaction is definitely in a different category. Online classes can be broken up into groups, but this requires more time and effort on the part of the instructor and makes the time issue even worse. Using groups online also requires guidance and practice. This is another area that needs to be incorporated into training programs.

The academic school or discipline did not have a strong effect on the goals set or use of discussions. However, the fact that a course was "technical" in any discipline was considered distinctive. Technical classes have unique problems and may require a different type of online class as well as technological improvements to the virtual classroom. Technical classes may require different textbooks and learning strategies.

Online classes cannot be viewed simply as face-to-face classes moved to the Internet. They are the same in some ways and different in others.

## 7. REFERENCES

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