# Enhancing Online Courses with Synchronous Software: An Analysis of Strategies and Interactions

**Shauna Schullo**
**Melissa Venable**
**Ann E. Barron**
**Jeffrey D. Kromrey**
**Amy Hilbelink**
**Tina Hohlfeld**

**University of South Florida**

Paper presented at the National Educational Computing Conference, Philadelphia, Pennsylvania, June 27-30, 2005.

**Abstract**

This study investigated a synchronous web-based course system (SWBCS) as a supplement to university courses taught via distance education. Specifically, the research investigated how and why instructors used the tools available within the synchronous system to enhance student learning. A mixed methods approach included student and instructor surveys, instructor and support personnel interviews and focus groups, classroom observations, analysis of event and problem logs, analysis of classroom recordings, and a researcher's journal. Analysis of the data collected provided insights regarding successful strategies for the integration of a SWBCS and documented the increased communications and interactions it provided. This research provides new insights into the use of synchronous learning environments in courses offered via distance.

# Enhancing Online Courses with Synchronous Software: An Analysis of Strategies and Interactions

The purpose of this study was to investigate the use of a synchronous web-based course system (SWBCS) as a supplement to existing courses offered via distance learning. A SWBCS is a web environment that provides an electronic means to communicate with distant students in real time, using numerous two-way tools in a single web-based interface. Tools that are common in a SWBCS include Voice Over Internet Protocol (VOIP) for conducting two-way audio conversations, electronic chat rooms or instant messaging for text-based communications, polling and feedback tools for instructors and students, presentation areas to display PowerPoint slides, breakout rooms for communication among group members, and application sharing. Although challenges exist for using a SWBCS in an online course (such as the complex interface and potential technological problems), these tools hold the potential to enhance the distance learning experience with increased interaction, immediacy, social presence, group work, and collaboration.

## Theoretical Framework

Examining current literature in distance education illuminates two major issues facing distance educators today. First, there are challenges in providing the optimal interaction, both course related and social, required for students to learn. Second, there is a lack of confirmed pedagogical strategies conducive to learning in synchronous environments. Both of these issues need to be addressed by educational researchers.

Research in distance education continues to emphasize the importance of interaction for effective teaching (Garrison, Anderson, & Archer, 2001; Hillman, 1999; McIsaac, Blocher, Mahes, & Vrasidas, 1999; Moore & Kearsley, 1996; Sherry, Fulford, & Zhang, 1998; Vrasidas & McIsaac, 1999). Studies indicate that interactions between students and instructors, as well as student-to-student, greatly enhance education at a distance by improving attitudes, encouraging earlier completion of coursework, increasing performance on tests, and facilitating greater retention (Hillman, 1999; Willis, 1995; Moore, 1989; Hillman et. al., 1994; Harasim, 1990). In addition, studies on distance education have found that the important social aspects required for students to be successful learners are frequently missing. Students in distance courses often assert feelings of isolation and detachment from their instructors and peers (Galusha, 1997; Hara & Khling, 1999; Kubala, 1998; Lockett, 1998). Many educators use asynchronous computer mediated communication (CMC) such as email and discussion boards, to address student isolation, but these asynchronous methods are not sufficient in many cases. Lack of immediacy still makes it difficult for students to connect quickly with each other or their instructors.

Most distance education methods, especially real-time solutions such as two-way video and audio, still emulate passive lecture hall modes of instruction for content delivery. Many asynchronous courses consist of large volumes of reading assignments. These methods suffer from long-standing pedagogical problems, such as the lack of active student participation and effective interaction, coupled with the lack of immediacy. The problems with these passive modes of instruction are heightened in distance education by the fact that students are unable to communicate face-to-face with their instructors and peers.

To enhance interaction in distance education, many instructors are combining asynchronous communications with synchronous content presentations. For example, a synchronous chat session might be combined with broadcast video to increase the opportunities to interact with students (McIsaac & Gunawardena, 1996; Burge & Howard, 1990). Even with these combined approaches, the increases in interaction between students and instructors and student-to-student interactions may not be sufficient to alleviate the isolation and potential frustrations the distance learner experiences. Well-planned pedagogical strategies are needed as instructors integrate synchronous tools.

**Research Questions**

Five research questions guided this inquiry:

1. What types of pedagogical strategies do instructors implement with the SWBCS tools?
2. How do instructors utilize the tools available in a SWBCS in a distance education environment?
3. With access to a multitude of tools available in a SWBCS, which tools do instructors choose to use?
4. Why do instructors use the tools and strategies that they choose?
5. What perceptions do students and instructors have toward SWBCS?

**Method**

The study took place at a large metropolitan research institution and employed a rigorous blend of research methods that examined how instructors, students, and support teams use synchronous software. This mixed methods approach included the following modes of data collection: student and instructor surveys, instructor and support personnel interviews and focus groups, classroom observations, analysis of event and problem logs, analysis of classroom recordings, and a researcher's journal. The triangulation of multiple sources of data helped to strengthen the validity of the research. The use of case study protocols and the creation of a case study database assisted in increasing the reliability of the study's findings by providing the means to replicate the processes and review the evidence directly, rather than relying on the final report alone (Yin, 1994).

The synchronous software used in the study was Elluminate Live!™, which was licensed by the university. Elluminate Live!™ combines many different tools into one interface that can enhance real time interactions within a web-based classroom. Systems of this type can be broken down into three broad categories based on the capabilities offered:

***Deluxe***. High-end systems offer two-way audio using voice-over Internet protocol (VOIP), options for one-way or two-way video, application sharing, text chat capabilities and the ability to work in groups. Some products in this category also provide learning-management features, such as course scheduling, tracking, and assessment.

***Standard***. This category includes systems that offer one-way VOIP audio or a phone bridge for two-way audio. Text chat is often used for feedback. Application viewing, in which learners can see but not modify documents exhibited by the instructor, are typical of these systems.

***Economy***. This category includes browser-based software that provides chat functions and some degree of application viewing. Client-side downloads are often unnecessary as long as Java-enabled browsers are being used

by learners. Products in this emerging category are offered free of charge or for little cost.

Elluminate Live! ™ is a deluxe package. Table 1 highlights each tool available in an Elluminate Live! ™ classroom, presenting a good picture of the overall system. A screen capture of the online environment in Elluminate Live! ™ is provided in Figure 1 to illustrate the environment.

Table 1. Features of a Deluxe Synchronous Web-based Course System

| | |
|---|---|
| Textual Chat | Textual chat allows for real-time conversations with all participants using the keyboard. It is sequential, with all messages intermingling based on when they were typed. Access can be controlled by the instructor or left open for anyone to use. |
| Visual Presentation | Visual presentation provides instructor, guest speaker or students, with authoring privileges so they can upload prepared presentation materials such as PowerPoint slides or web pages for viewing by all participants. |
| Auditory Presentation | Auditory presentation provides a means for two-way communication among all participants. Access can be controlled by the instructor or left open for anyone to use. Only one person may use the microphone to speak at any one time. |
| Polling/ Questioning | Polling and questioning features provide a means of getting feedback and responses from the participants. Questions are presented in a multiple choice format and students are able to respond with a click of the mouse. Results are displayed immediately. |
| Hand Raising/ Learner-Instructor Interaction tools | Students can interact with the instructor by "raising their hands" in a manner similar to the face-to-face classroom. The instructor is notified and students are placed in a queue based on who raised their hand first. Students have access to tools that allow for emotional reaction such as smiling, applauding, frowning or asking the instructor to slow down. |
| Guided web Surfing | This allows the instructor to display a web site he/she wants the students to explore. |
| Group Breakout Rooms | This feature permits the instructor to place students into groups in a "private" room. Once in this room, all the same tools are available. An instructor can elevate the status of a group member to moderator to provide control over the breakout room. |
| Application Sharing | Application sharing provides a means to work collaboratively with any software installed on the instructor's or the student's computer. It is useful for demonstrations and collaborative work. |

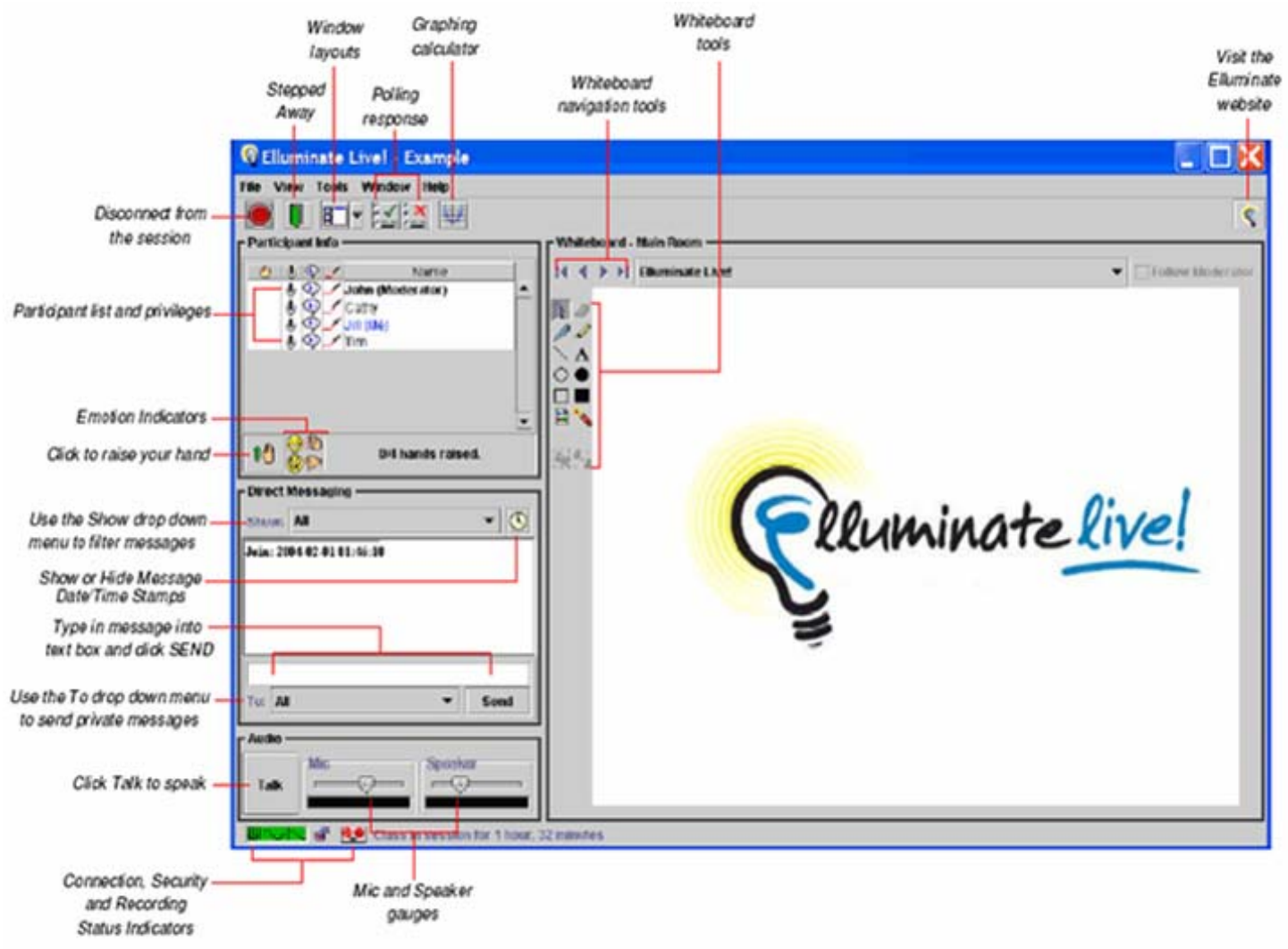


Figure 1. Screen Capture of the Elluminate Live!™ Synchronous Environment

All university faculty were invited to participate in the pilot test of this SWBCS. For this study, eight instructors with unique teaching styles and experience as distance instructors were selected by purposeful sampling. These instructors taught in the College of Nursing (n=1), the College of Engineering (n=2), Library and Information Sciences (n=2) and the College of Education (n=3). Three were full professors, two were adjunct instructors, two were assistant professors, and the last was a full time instructor with additional administration duties. One Library and Information Sciences course was dropped from the study due to lack of data from students and two of the Education courses were used in pilot studies. All were teaching at least a portion of each observed course online and had varying levels of experience in distance education. One instructor worked from a remote campus. Prior to implementation, instructors received training on the use of the synchronous software. One training session was conducted in a classroom; the other three sessions were conducted synchronously, over the Internet.

To facilitate delivery, instructors were provided with assistance from a support personnel team. These "producers" assisted each instructor during the "live" classroom sessions to help enroll the students and trouble-shoot any technical issues. The instructors' use of the system was not limited by the study or the support team; rather, each instructor used the system in a way that supported his or her teaching style as well as the learning styles of the students. All sessions were recorded for later analysis.

**Data Collection**

Students were surveyed twice during the semester, once when they began using the synchronous software and once at the end of the semester. The first survey provided a baseline on student experience levels as well as demographics. The second survey examined the perceptions that students held after using the synchronous software throughout the semester. Each instructor was interviewed after an initial orientation and training session, yet prior to course delivery. Questions focused on the anticipated advantages, challenges, and concerns with implementation of synchronous software. Instructors also completed an end-of-semester survey that examined their perspectives and how they ultimately utilized the synchronous environment in their courses.

The research on transactional distance and social learning provided a beginning framework for this study. The ideas around social learning include many sub categories, such as social presence and community building. Jung (2001) extended the theories of interaction proposed by Moore (1989) and Hillman, et al. (1994) to include academic interaction, collaborative interaction, and interpersonal interaction. By combining Jung's work with that of Moore (1989) and Hillman et al.'s (1994) theories of interaction and the concept of guiding pedagogical strategies, many different aspects of the courses could be examined (See Figure 2).

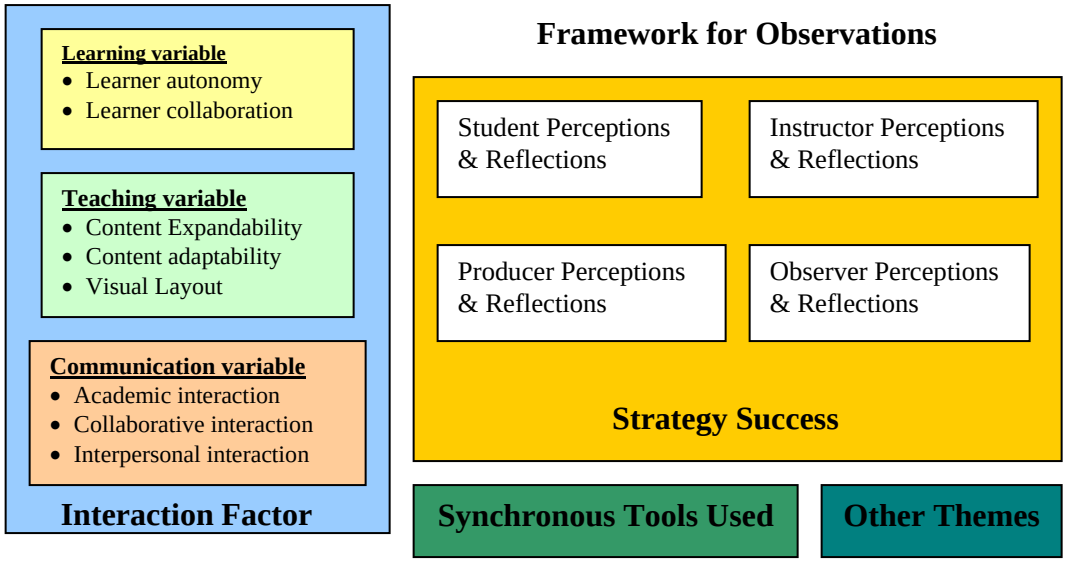


Figure 2. Theoretical Framework based on Jung (2001), Moore (1989), Hillman et. al. (1994) and implementations of pedagogical strategies in a synchronous online classroom.

An instrument was developed based on this theoretical structure and traditional classroom observation instruments to document direct observations as well as subjective interpretations of classroom events. The primary categories under investigation included pedagogy, interactions, structure, learner autonomy, and tools used. The design and implementation of this instrument was iterative.

The instrument consisted of yes/no indicators that were coordinated with an open-ended comment area for description or explanation. These questions fell into the following seven categories; (1) general *information about the session* being observed, (2) *pedagogical strategies*, (3) *interactions*, (4) *structure*, (5) *learner autonomy*, (6) *tool usage*, and (7) *success* of the session. Each category began with a definition of the category and closed with an open-ended summary area. Within each category, directly observable as well as judged items were reported.

This instrument was developed through much iteration in which multiple observers recorded information. After all data were obtained for a specific recording, the results were compared and adjustments were made to increase clarity and reduce the number of items necessary to collect data. Six observers were involved in the final stages of reliability testing. Although the final version had good inter-rater reliability, complete agreement was reached through discussion of each question with less than 80% agreement. The last iteration was finalized using a pilot case. The resulting item inter-rater agreement coefficients (Figure 3) suggest excellent agreement on the majority of indicators. Only a few problems were determined in this stage and were clarified with minor wording changes and minimal edits. Upon discussing the differences found in the data, all six observers had perfect agreement. This iterative process proved valuable, and the final version of the instrument was used to examine all remaining cases.

| Stem | Leaf |
|---|---|
| 10 | 00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000 |
| 9 | |
| 8 | 00000000033333333333333333333333 |
| 7 | 5555 |
| 6 | 0000777777777777 |
| 5 | 000 |
| 4 | |

Figure 3. Stem-and-Leaf Plot of Item Level Inter-Rater Agreement Coefficients

Additional data were collected in the form of documents generated by faculty, students, producers, technical support personnel and the research team. These documents included email, discussion board postings, training materials, support documentation, web sites and a researcher's journal. They included positive aspects of the project, problems encountered, and troubleshooting responses. Thematic analysis of these documents helped to triangulate and validate the other data collected.

**Results**

The results were analyzed qualitatively, based on a theoretical framework that examined interactions, structure, learner autonomy, the success of the pedagogical strategy used, as well as the perceptions of those involved. The full results of one case will be discussed here as an example of the resulting data. Data collected for this case included student surveys, session recordings, observations, a faculty interview, and a faculty survey. In addition, archival documents such as web sites and emails were examined to fill in the gaps.

**Summary of Case 1**

***Instructor***. This course was taught by a full professor with 14 years of experience teaching in higher education and approximately 10 years experience teaching via the web. She regularly teaches face-to-face and distance graduate-level courses in multimedia, instructional design, web design, and telecommunications.. Before this study, this graduate level Web Design course was taught asynchronously online through WebCT with little real-time interaction. The interview with this instructor was useful in understanding her experience with synchronous tools and her approach at the beginning of the study. Although she was an experienced distance instructor, she had not previously used a synchronous classroom to teach. However, she was open to the possibilities and excited about the experience.

***Students***. This semester, 18 students were enrolled in the course. Eleven responded to the initial survey and provided background information and demographics for the study. Students' ages ranged from 20 to 59 with 27% of the students (n = 3) being less than 30 years of age and 36% (n = 4) being more than 50 years old.

Six of the students reported their major field of study as *Instructional Technology*, while the remaining five reported a variety of fields (i.e., education, business education, recertification of teaching, English, and communication). Students' distance from campus varied, with 54% living less than 30 miles

away and 36% living more than 60 miles away. Ten out of the 11 students stated they would access the course from their home computers. The age of these computers mainly fell in the 0-2 year range (81.8%), with the other 18.2% falling in the 3-5 year range. To determine if there would be additional problems due to Internet connection speeds, students were asked how they would be connecting to the Internet. Most students planned to connect at high bandwidths. Only one student was using a dialup modem, four used cable modems, five had DSL connections, and one accessed the course via a LAN. When asked which features were available on the computers the students were going to use for the class, the results showed that all computers were adequately prepared.

Although experience levels varied, the majority of the students did not have much experience with online courses; 45.5% reported this was their first online course, 27.3% had taken one online course, and 18.2% reported four or more courses. Of those with online experience, 54.6% described their previous online courses as at least 80% online, rather than blended or on campus. Table 2 reflects the proficiency levels students reported with various types of software.

Table 2. Distribution of Student Self-Reported Software Proficiency

| **Software Type** | **Beginner** | **Intermediate** | **Advanced** |
|---|---|---|---|
| Word Processors | 0 | 4 | 7 |
| Spreadsheets | 1 | 7 | 3 |
| Presentation software | 0 | 5 | 6 |
| Email | 0 | 1 | 10 |
| Chat | 2 | 5 | 4 |
| Web Page Creation | 5 | 4 | 2 |
| Audio & Video programs | 5 | 6 | 0 |
| Web Browsers | 2 | 3 | 6 |

In order to obtain additional baseline information, students were asked to report what synchronous tools they had previously used. Three students reported experience with text chat, two reported use of two-way audio and two reported previous experience in a full synchronous online classroom.

Other questions were asked to determine students' objectives in taking the course. Nine out of 11 students said they would *not likely* have taken the course if it were not offered in an online format, while only two stated they would *likely* or *definitely* take it regardless of format. Students also were asked if they were aware of the synchronous requirement and if they had allotted time for the sessions. Out of the 11 students responding to the survey, eight were not initially aware of the requirement. However, all 11 stated that they had allotted time for the sessions in their schedules.

The students were asked if they participated in a demonstration of the synchronous software before attempting their first session. Eight of the students in this case answered '*no'* and three answered '*yes'*. Only five students answered the follow up question about how prepared they felt for the synchronous sessions with two feeling *not prepared*, two feeling *somewhat prepared*, and only one feeling *well prepared*. When students did experience problems, help was not difficult to get (all 11 students reported that help was *easy* or *very easy* to obtain).

Eleven out of 13 students found the system was *very easy* to use. The majority of the students (n=12) reported *no problems* connecting to the synchronous classroom with only one having *minor problems*. In addition, 84.5% of the students had *no problem* getting familiar with the new interface. Overall, very few problems were noted with specific features of the synchronous classroom (Table 3).

Table 3. Frequency and Severity of Problems with the Synchronous Classroom Reported by Students

| Feature | No Problem | Minor Problem | Major Problem | Not Applicable |
|---|---|---|---|---|
| Text chat | 12 | 1 | 0 | 0 |
| Two-way audio | 10 | 3 | 0 | 0 |
| Hand raising and Yes/No (or check/X) | 13 | 0 | 0 | 0 |
| Whiteboard | 12 | 1 | 0 | 0 |
| Application Sharing | 7 | 0 | 0 | 6 |
| Breakout Rooms | 11 | 1 | 1 | 0 |
| Taking Polls or Quizzes | 10 | 2 | 0 | 1 |
| Guided Web Surfing | 8 | 0 | 0 | 5 |
| Other | 6 | 0 | 0 | 3 |

In order to determine the success of the tools used during the sessions, the students were asked about the usefulness of each feature. With the exceptions of application sharing and guided web surfing, the majority of students reported that all features were very useful (Table 4).

Table 4. Reported Usefulness of Features in the Synchronous Classroom

| Feature | Not Useful | Somewhat Useful | Very Useful | Not Applicable |
|---|---|---|---|---|
| Text chat | 0 | 2 | 10 | 1 |
| Two-way audio | 0 | 1 | 11 | 1 |
| Hand raising and Yes/No (or check/X) | 0 | 2 | 10 | 1 |
| Whiteboard | 0 | 4 | 8 | 1 |
| Application Sharing | 0 | 1 | 4 | 8 |
| Breakout Rooms | 0 | 2 | 10 | 1 |
| Taking Polls or Quizzes | 0 | 1 | 10 | 2 |
| Guided Web Surfing | 0 | 1 | 6 | 6 |

In addition to ratings of the usefulness of features, the students' perceptions of the quality of the synchronous software were measured (Table 5). The majority of students rated each aspect as *excellent*, with no rating lower than *good*. When asked if they thought that taking this course was a good idea, 11 of the 13 students responded '*yes*'. Additionally, they thought that the organization was logical and easy to follow. More importantly, 75% felt that synchronous session activities and assignments *almost always* facilitated their understanding of course content. 83.3% felt that the sessions were *almost always* aligned with the course objectives and 66.7% felt that the instructor's approach to using Elluminate Live!™ was *almost always* effective.

Table 5. Student Ratings of Quality of the Synchronous Classroom

| Feature | Poor | Fair | Good | Excellent | Not Applicable |
|---|---|---|---|---|---|
| Elluminate Presentation Space | 0 | 0 | 4 | 9 | 0 |
| Elluminate Audio | 0 | 0 | 6 | 7 | 0 |
| Elluminate Screen Layout | 0 | 0 | 5 | 8 | 0 |
| Ways to offer instructor and others feedback (i.e. emoticons, applause, hand raising, etc.) | 0 | 0 | 4 | 9 | 0 |
| Your connection to Elluminate | 0 | 0 | 3 | 10 | 0 |
| Collaboration tools (i.e. whiteboard, application sharing, breakout rooms, etc.) | 0 | 0 | 4 | 9 | 0 |
| The overall quality of the Elluminate experience | 0 | 0 | 4 | 9 | 0 |

Many educational researchers suggest that interactions are a critical part of learning and should be encouraged in many ways. With this in mind, questions were asked that addressed how interactions were perceived when using a synchronous online classroom. In this case, 91.6% felt that interactions with their classmates and/or the instructor were effective when using the synchronous software, 66.7% felt that synchronous discussions with their peers were encouraged in the sessions, and 91.6% felt that the instructor *almost always* provided opportunities for students to participate during the sessions. Interactions with the instructor can take many forms. Opinions on instructor feedback address both instructor interactions and also immediacy in the classroom. In this case, 83.3% of the students felt that the instructor *almost always* provided constructive feedback during the synchronous sessions.

The goal of educational environments is for students to increase their content knowledge and develop new skills. In these sessions, 33.3% of the students reported that the sessions allowed them to *frequently* demonstrate their learning while 41.7% stated the sessions *almost always* allowed them to demonstrate their learning.

One string of thought on the use of synchronous technologies for teaching at a distance is that it allows for increased connections that build a stronger learning community. With this in mind, students were asked if using Elluminate Live!™ made them feel more connected to others in their class. The majority (83.3%) stated that they *almost always* felt more connected and 8.3% said they *frequently* felt more connected. In addition, 75% felt *almost always* more connected to the instructor and 16.7% felt *frequently* more connected.

Using technology should enhance the learning process rather than create more chaos. Students in this class felt that the technology used *almost always* (66.7%) or *frequently* (33.3%) enhanced their learning experience. No one felt that the technology *rarely* made a difference. In addition, students felt that the use of this technology motivated then to learn with 58.3% choosing *almost always* and 41.7% choosing *frequently*.

Students did not seem to be resistant to the technology, but rather they would consider taking additional courses that used synchronous technologies. When students were asked to compare this course to other courses they have taken, 58.3% stated the course was *almost always* excellent and 41.7% stated it was *frequently* excellent. No one stated that the course was not excellent.

**Summary of Observations for Case 1**

The results of the observation for this case supported the findings from the student surveys that the sessions were successful. Strengths seen by the observers in this case included a variety of indicators, however the most common focused on the organization and well-planned structure of the session. Other strengths included the following: 1) the learning objectives were clear 2) an effective and positive learning environment was promoted by students actively engaged in the activities, 3) a good rapport was developed among all involved in the session, 4) sufficient wait time was provided for students to try the tools and to respond to questions, 5) the instructor answered all questions promptly and effectively, 6) students could participate by raising their hand to ask questions at any time, and 7) the content presented was appropriate for the venue.

A few weaknesses were mentioned by the observers; however, they were not seen to adversely impact the success of the session. For example, there were some minor technical glitches. At one point the instructor wanted to use a tool which she had not practiced, but the students were not aware of this as they were in a breakout room. In addition, the instructor was not completely familiar with the quizzing tool and was unable to answer questions on how it worked. One observer felt that community building was not incorporated. However, it was noted that building a community may develop over time (and require more than one class session).

The pedagogical strategies were judged by the observers to be a good mix of lecture, interaction, questioning, and discussion. The session resembled a traditional whole class activity with lecture/discussion. In addition, problem solving group activities were implemented through scenarios. Follow-up discussions were considered effective in encouraging the students' critical thinking.

Interaction in this session was encouraged and effective. Evidence of instructor-learner, learner-learner, and learner-content interaction was seen. In addition, learner-interface interactions were positive, with only minor problems and minimal frustration on the part of the students. The instructor made students comfortable by knowing and using their names and providing sufficient wait time for responses to questions and activities.

The session was well structured. It began on time in an orderly fashion and stayed on topic throughout. Materials were readily available and maintained the students' attention. Opportunities for dialog were provided with the instructor as well as others in the class. It was judged that the instructor was well prepared and had a clear organizational plan for the session. Objectives of the session were outlined, summaries and transitions were provided, and the content was related to the students' general education and real world applications. Concepts were explained well and explicated with examples from the field. It was judged that the main ideas were clear and captured the attention of the students. Sufficient variety was provided to support the information being presented. The presentation of content was visually and audibly clear with a varied pace. The presentation included both audio and visuals as needed. Overall, the instructor communicated well with confidence, enthusiasm and excitement toward the content.

Although this session did not have a high level of learner autonomy, some elements were seen. For example, students worked alone on polls and quizzes. In addition, most students asked productive questions, and the student discussion in groups was spread equally among participants. Although not many students had technical difficulties, those who did seemed to bounce back and continue to be productive members of the class. It was judged that the strategies used provided for multiple learning styles. Students exhibited positive attitudes about this learning experience, as they seemed to enjoy the discussions and the challenges that the instructor provided.

As for tool usage, most Elluminate Live!™ tools were used in this session including voice over internet protocol (VOIP) audio, breakout rooms, whiteboard, a shared browser, direct and private messaging, and interactive tools. The interactive tools that were used included polls, quizzes, hand raising, emoticons and the step away feature. Using this variety of tools to present material helped to produce a successful session.

**Discussion of Additional Cases**

Five additional cases were analyzed in a similar fashion to case 1. One significant difference was the number of sessions that were observed. In each of the remaining cases, three sessions were observed by five different observers. Full summaries of all five cases are not appropriate for this short paper and would seem repetitive. However, results of the observations as well as other data collected offer relevant material for discussion relating to the research questions of this study.

***The Courses***

The courses studied in this project were from a variety of disciplines. They were all taught at a graduate level and each had been taught via distance technologies previously. The number of students enrolled varied from 10 to 33. Table 6 provides a quick overview of the courses that made up each case.

Table 6. Overview of Cases – the Sample of Courses

| Case | College | # of Students Enrolled | Level | Description of Course |
|---|---|---|---|---|
| 2 | Nursing | 33 | Graduate | An Epidemiology course taught asynchronously over the Internet with mandatory initial and final face-to-face meetings. |
| 3 | Education | 13 | Graduate | A course on microcomputers for school managers taught asynchronously over the Internet with mandatory initial and final face-to-face meetings. |
| 4 | Engineering | 10 | Graduate | An entrepreneurial course in Human Relations for Technical Managers utilizes streaming video and asynchronous technologies over the Internet. |
| 5 | Engineering | 33 | Graduate | The capstone course for the MS Engineering Management curriculum utilizes streaming video and asynchronous technologies over the Internet. |
| 6 | Library and information Science | 25 | Graduate | Information Architecture and Design course described as a blended class with part of the course online and part of it face-to-face. |

***The Instructors***

The instructors who participated in this study had different levels of teaching experience, but all had at least some experience as distance educators. Table 7 represents each instructor's experience, rank and the assignments that they currently hold. This information is important when looking at the results of these cases from a broader perspective and using them as guidelines for others.

Table 7. Overview of Cases – the Sample of Instructors

| Case | Status | Rank & Experience | Work load |
|---|---|---|---|
| 1 | Pilot testing of instruments only | Full Professor<br>14 years teaching in higher education, 10 years via distance | Full teaching load of 3 classes. Serves on the Board of Directors for the Florida Center for Instructional Technology and is the Coordinator of the Ed.S. program. Publishes, presents and conducts research on a regular basis. |
| 2 | Full case | Instructor<br>4 years in current teaching position with both face-to-face and distance courses. | Full teaching load, 3 courses totaling over 100 students. Serves on many committees. Is continuing personal education. |
| 3 | Full case | Instructor<br>3 years teaching current course since obtaining her PhD in 2001. Much of her experience is in distance education. | Teaches 3 sections of graduate level courses. Holds an administrative position in support of faculty using distance and technology education on a remote campus. Serves on many committees. |
| 4 | Full case | Full Professor<br>30 years teaching in higher education, most including distance education. | Full teaching load of 3 courses. Dean of outreach for the Florida Engineering Education Delivery System (FEEDS). On the board of two honor society and represents university on many committees. |
| 5 | Full case | Lecturer<br>18 years teaching in higher education, past 12 years through Florida Engineering Education Delivery System. | Teaches 2 courses with 30-40 students in each. Also teaches a self paced course. Serves as undergraduate coordinator for Industrial Engineering department. Oversees graduate research and is very involved in the many college projects. |
| 6 | Full case | Assistant Professor<br>Taught in higher education for over 10 years with extensive experience in distance education and technology. | Teaches 2 courses with approximately 25 students in each. Continues to work toward tenure with publications and research. Also serves on many committees such as the universities Instructional Technology committee. |

***The Students***

The students in each case were graduate students. The demographics of each case were similar, but did vary in some areas. Table 8 provides a quick overview of the student demographics.

Table 8. Overview of Cases – the Sample of Students

| **Case** | **Student Profile** | | | | | | |
|---|---|---|---|---|---|---|---|
| | ***Survey Responses/ Enrolled*** | ***Age Ranges*** | ***Type of Internet Connection*** | ***Distance from Campus*** | ***Online Courses Taken*** | ***Software Proficiency Levels*** | ***Synchronous Experience*** |
| 2 | 33/33 | 33% < 30<br>24% < 40<br>11% < 50<br>9% >50 | 6-dialup<br>16-cable<br>10-DSL<br>0-LAN | 30% < 30 miles<br>36% > 60 miles | 35% - 3<br>46% - 4+ | Evenly spread | 4-chat<br>1-audio<br>2-video<br>1-app. share<br>2-SWBCS |
| 3 | 3/13 | 67% < 30<br>33% < 40 | 0-dialup<br>1-cable<br>2-DSL<br>0-LAN | 67% < 30 miles<br>33% > 60 miles | 67% - 0<br>33% - 1 | Beginner to Intermediate | 1-chat<br>1-audio<br>0-video<br>0-app. share<br>0-SWBCS |
| 4 | 7/10 | 71% < 30<br>29% < 40 | 0-dialup<br>6-cable<br>0-DSL<br>1-LAN | 87% < 30 miles<br>0% > 60 miles<br>* one student was out of the country | 57% - 0<br>29% - 2<br>14% - 4+ | Mainly Advanced | 2-chat<br>1-audio<br>0-video<br>1-app. share<br>0-SWBCS |
| 5 | 16/35 | 38% < 30<br>43% < 40 | 2-dialup<br>7-cable<br>3-DSL<br>4-LAN | 44% < 30 miles<br>13% > 60 miles | 40% - 0<br>27% - 1<br>7% - 2<br>27% - 4+ | Intermediate to Advanced | 5-chat<br>4-audio<br>0-video<br>2-app. share<br>1-SWBCS |
| 6 | 15/25 | 53% < 30<br>40% < 40<br>7%>40 | 1-dialup<br>6-cable<br>3-DSL<br>4-LAN | 93% < 30 miles<br>7% < 60 miles | 20% - 0<br>40% - 1<br>40% - 4+ | Intermediate to Advanced | 7-chat<br>1-audio<br>0-video<br>4-app. share<br>1-SWBCS |

Taking all of the data sources into consideration, the research questions were addressed for each case. Analysis of this qualitative data from the five additional cases resulted in the following answers to the research questions.

***Question #1 - What types of pedagogical strategies do instructors implement with the SWBCS tools?***

The results for this question utilized the following data collection methods; instructor surveys, interviews and focus groups; observation instrument; and archival documents. In case 2, the instructor used a variety of strategies that were similar to those she implemented in her regular classroom. For example, she used interactive lecturing techniques that contained full class lecture, polling, questions and answer sessions, and classroom discussion. The course also utilized breakout rooms so students could work in small groups on project-based assignments.

In contrast, the instructor in case 3 worked with small groups of students rather than the class as a whole. She also chose to present short lecture segments followed by interactive discussion with the students; however, her course divided into small group sessions (approximately three students at a time) that met with her one after the other. The information was presented both through slides and by using the shared web browser. Similar to case 2, the students were required to interpret and report findings based on their real world situation during the sessions.

Case 4 utilized case study methodology throughout all synchronous sessions. The course required students to read the cases and review questions in preparation for the sessions. During the sessions, the instructor read questions from the text, and then all the students were expected to participate and share their opinions. The instructor provided analysis and real-life examples, which encouraged interaction and repeated input from students. He played the role of facilitator, only calling on students to answer when the conversation lagged and they needed prompting. This case did not include the use of formal or visual presentation, opting instead for open discussion.

As a contrast to most other cases, case 5 used the SWBCS for group work only. There was no lecture or formal presentation of materials. The instructor put students into separate breakout rooms so that they could communicate about weekly projects on which the course was heavily based. The project the students worked on was an on-going competitive game called “Threshold” that lasted all semester with each team working as a player in the game. The synchronous system was used for the teams to communicate and plan strategy.

In case 6 the instructor also used a variety of pedagogical strategies to conduct his sessions. A combination of software demonstration and lecture made up a good portion of the sessions, however he also involved the students through question/answer and discussion. On occasion, students presented information from assignments completed during the week. The instructor often used the web push feature to bring content into the sessions as lecture material and occasionally used breakout rooms for small group work.

Table 9 summarizes the pedagogical strategies used in the sessions for each case as recorded through the observation instrument. All three sessions observed were collapsed into one number resulting in a value from 0-3 for each question. There were 36 total possible opportunities to observe pedagogical strategies in each case.

Table 9. Summary of Pedagogical Strategies Observed

| | Case 2 | | | | Case 3 | | | | Case 4 | | | | Case 5 | | | | Case 6 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sessions** | **1** | **2** | **3** | **Total** | **1** | **2** | **3** | **Total** | **1** | **2** | **3** | **Total** | **1** | **2** | **3** | **Total** | **1** | **2** | **3** | **Total** |
| **Directly Observable Pedagogical Strategy - 18 options total** | | | | **14** | | | | **14** | | | | **11** | | | | **3** | | | | **11** |
| Instructor lectured – conveyed information through talking or demonstration - Direct (telling, lecturing) whole group. | x | x | x | 3 | x | x | x | 3 | x | x | x | 3 | | | | 0 | x | x | x | 3 |
| Instructor used interactive direction with whole group (posing questions and calling for answers) | | x | x | 2 | x | x | x | 3 | x | x | x | 3 | | | | 0 | x | x | x | 3 |
| Instructor questioned at different levels | | x | x | 2 | x | x | x | 3 | x | x | | 2 | | | | 0 | | x | | 1 |
| Individual students worked alone | | x | x | 2 | x | x | | 2 | | | | 0 | | | | 0 | | | | 0 |
| Students worked in pairs or small groups | | x | x | 2 | | | | 0 | | x | | 1 | x | x | x | 3 | x | | | 1 |
| Students acted as a whole class (ie. large class discussion, full class quizzing or polling, lecture, whole class project etc.) | x | x | x | 3 | x | x | x | 3 | x | x | | 2 | | | | 0 | x | x | x | 3 |
| **Pedagogy - Judged Pedagogical Strategy - 18 options total** | | | | **14** | | | | **17** | | | | **18** | | | | **13** | | | | **11** |
| The teaching strategies utilized tools appropriate for the students' level of skill with the technology and were well supported | x | x | x | 3 | x | x | x | 3 | x | x | x | 3 | x | x | x | 3 | x | x | | 2 |
| Teaching methods were appropriate for the content | x | x | x | 3 | x | x | x | 3 | x | x | x | 3 | x | x | x | 3 | x | | x | 2 |
| Lesson required student thought and participation– explain. | | x | x | 2 | x | x | x | 3 | x | x | x | 3 | x | x | x | 3 | x | x | x | 3 |
| The teaching strategy included a problem solving activity– explain. | | x | x | 2 | | x | x | 2 | x | x | x | 3 | | x | x | 2 | | | | 0 |

| | Case 2 | | | | Case 3 | | | | Case 4 | | | | Case 5 | | | | Case 6 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| The Instructor set cognitive tasks for the students – explain. | | x | x | 2 | x | x | x | 3 | x | x | x | 3 | | x | | 1 | | x | x | 2 |
| Session required higher order (not route memory or just opinion) and/or critical thinking on the part of the students– explain. | | x | x | 2 | x | x | x | 3 | x | x | x | 3 | | x | | 1 | | x | x | 2 |
| Other approaches (Description or explanation with approximate time codes) | | | | | | | | | | | | | | | | | | | | |
| **Summary of Pedagogy Used -total options 36** | **4** | **12** | **12** | **28** | **10** | **11** | **11** | **31** | **10** | **11** | **8** | **29** | **4** | **7** | **5** | **16** | **7** | **8** | **7** | **22** |

***Question #2: How do instructors utilize the tools available in a SWBCS in a distance education environment?***

The results for this question utilized the following data collection methods; instructor surveys, interviews and focus groups, observation instrument, and archival documents. In case 2, the instructor utilized the SWBCS tools to increase satisfaction and the success of the course by adding interactions through sound pedagogical strategies. Interaction between the instructor and the students as well as interaction of the students with each other were encouraged with the use of the SWBCS in this course. Most of the interactions that were visible were considered to be academic in nature rather than social or technical. The instructor used the SWBCS to supplement instruction for concepts that had been notoriously difficult for the students in past classes. The immediacy of the SWBCS allowed faster and more successful interaction to take place and helped to alleviate issues with this difficult subject matter.

Similarly, the instructor in case 3 used the tools in a way that supported the instruction she had planned for increasing student comprehension and interaction. Her use of PowerPoint slide visuals supported her goals to focus and organize the discussion and improve the assimilation of course content. She also used tools to check student comprehension and increase the connections between members of each group and herself.

The instructor in case 4 utilized tools for significant discussion of case studies among students in diverse locations. One of the students in this case was in Kabul, Afghanistan. The use of SWBCS allowed the students and the instructor to have long (1.5 hour) discussion on cases that were relevant to the content of the course. Each week, two case study discussions took place over a period of about three hours. The case study method is a good approach used in regular classrooms, but it is often difficult to implement via distance technologies due to lack of immediacy of asynchronous methods and the difficulties encountered when using textual chat for long conversations. The use of VOIP was more natural and solved many of these issues.

Many of the available tools were not utilized by the instructor in case 5 due to the session goals and the teaching strategies implemented. The breakout room feature was used to offer a private space for each group to process information concerning the semester long “game” of running a company. Although the instructor began each session personally and placed students into rooms, the sessions were very much student driven. Student use of the tools to accomplish their goals varied significantly and were difficult to observe as breakout rooms are not recorded.

Case 6 was unusual in that it contained both face-to-face students and students at a distance. For this reason, the tools used may have been different than those observed in other cases. The instructor used audio and chat to communicate with all of the students. Those in the classroom had computers with which they could participate. The pushing of web sites was used to present content to all students and may have made this easier for all involved. Overall he used the tools in an exploratory fashion to determine if this type of situation was feasible for his course. He tried to make connections between the face-to-face and distance students, as well as between the students and himself.

Overall, all instructors used the tools to meet their needs and successfully accomplished their teaching goals.

***Question #3: With access to a multitude of tools available in a SWBCS, which tools do instructors choose to use?***

The results for this question utilized the following data collection methods: instructor surveys, interviews, and focus groups, observation instrument, and archival documents. Table 10 provides a summary of the tools that were used in each case. The values seen in the table represent the number of sessions (out of the 3 observed) in which the observers saw the tool used. A more descriptive summary is provided in the following section in answer to the research question about which tools instructors use.

Table 10. Number of Lessons in which SWBCS Tool Use was Observed

| Tools | Cases | | | | | Total Tool Use |
|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | |
| Voice Over Internet Protocol (VOIP) Audio | 3 | 3 | 3 | 3 | 3 | 15 |
| Textual Chat | 2 | 3 | 3 | 3 | 3 | 14 |
| Hand Raising | 3 | 3 | 2 | 0 | 3 | 11 |
| Emoticons | 3 | 3 | 0 | 2 | 3 | 11 |
| Whiteboard | 2 | 3 | 0 | 3 | 3 | 10 |
| Step away feature | 3 | 1 | 1 | 2 | 3 | 10 |
| Breakout Rooms | 3 | 0 | 0 | 3 | 2 | 8 |
| Shared Browser | 2 | 2 | 0 | 0 | 2 | 6 |
| Private Messaging | 0 | 0 | 0 | 3 | 2 | 5 |
| Polling | 3 | 2 | 0 | 0 | 0 | 5 |
| Application Sharing | 1 | 0 | 0 | 0 | 0 | 1 |
| Quizzing | 1 | 0 | 0 | 0 | 0 | 1 |
| Pace Meter | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals for each case | 26 | 19 | 9 | 17 | 24 | |
| A variety of the available tools were used to present materials | 3 | 3 | 0 | 0 | 1 | 7 |
| Use of tools was effective | 3 | 3 | 3 | 3 | 1 | 13 |

Case 2 used a significant variety and combination of the tools available to reach the goals the instructor had set for her sessions. She lectured using the VOIP feature, and used slides and the whiteboard mark up tools to draw the students' attention to the areas of the screen about which she was speaking. In addition, the instructor utilized the polling feature to check for student comprehension. The breakout rooms were used to facilitate project-based learning by allowing project groups to interact online.

In a similar fashion, the instructor in case 3 implemented extensive use of VOIP in conjunction with hand raising for students to indicate that they had questions, and she encouraged the use of emoticons for students to indicate comprehension. VOIP was used as a communication medium to explain the technology, while the whiteboard was utilized to present visuals to keep things on track. Students were encouraged to participate in discussions about content provided through the shared browser in two of the three sessions observed.

Using a different model, the instructor in case 4 used only a minimal set of tools to accomplish the goals he was trying to reach. Although it was determined by the observers that the addition of visual tools might have improved the sessions, the overall use of tools was effective. VOIP was used extensively with chat and hand raising supplementing the conversations that took place during case study discussions.

Case 5 stood out as a special case and accordingly had a different purpose for using a SWBCS. Since the purpose for this case was to facilitate group work, the instructor actually used a minimal set of tools. Breakout rooms are not recorded in the SWBCS, and since most of the interaction took place in breakout rooms, it was difficult to ascertain what actually took place. However, a special session recorded by the researcher in real time allowed for viewing of one full session of breakout room use. In this session, students' use of VOIP, whiteboard, and chat were significant. Other tools were not readily available for the students to use because the instructor (moderator) put them into rooms without giving them control over the elements of the system. In this case, some adjustments to how the system was used might have improved the student's use of the tools and their perception of the overall experience.

The instructor in case 6 used a combination of the tools as an exploratory exercise. As a result, he used a number of tools in his sessions; including lectures which utilized both the VOIP feature and web push. Chat was used by both the instructor and students. This allowed the in class and distance students to make comments during periods when the instructor was speaking without interrupting the lecture. The breakout rooms were used to allow small groups to interact online.

***Question #4: Why do instructors use the tools and strategies that they choose?***

The results for this question utilized the following data collection methods; instructor surveys, interviews and focus groups. The instructor in case 2 used the tools provided based on her experience, the strategies she selected, the needs of her class, and the training she had received. She needed to provide clearer instruction on difficult concepts and allow students time to practice these concepts while she was immediately available for feedback. The use of VOIP, the whiteboard, and polling tools allowed the students and the instructor to communicate about difficult subjects with more immediate feedback. In addition to these tools, the instructor used the web push feature to provide students access to data that would be discussed and used later during group projects. Using this tool in conjunction with VOIP, the instructor was able to guide students through the web site and explain what they would need to accomplish their project goals. The instructor also chose to use the breakout rooms as a means for students to interact

among themselves in smaller groups. The immediacy of the SWBCS along with the familiarity of voice rather than textual chat allowed the students to collaborate on assigned projects.

During the interview for case three, this instructor voiced a concern that the course contained too much content to share in too short a time, especially asynchronously. She hoped to use the SWBCS to focus students and help them meet their contracted individual and group goals. To do this, she interacted with students in small groups and guided them through the content with synchronous activities. In this case, the immediacy of the SWBCS and the tools the instructor used supported the small learning community's growth.

Although the instructor in case four did not feel that what he was currently doing with asynchronous methods and textual chat was problematic, he thought using the SWBCS would improve the course. He considers himself a pioneer when it comes to technology use in the classroom and felt he should try this new system. Although he had used chat successfully in the recent past, he felt using audio and video was a better approach as it allowed him to listen and hear voice inflections rather than read, thus helping him to understand the students level of understanding. He also felt that students would learn more by hearing and responding to someone else's rebuttal. The case study discussions were long (1.5 hours) with two cases discussed each session. This process would have been much more difficult with textual chat only. This process also allowed the instructor to extend the reach of the course in a more natural manner, somewhat meeting the need he saw for students to have "live" (preferably face-to-face) interaction with the instructor. For all of these reasons, the use of the SWBCS met the needs of this instructor and his course.

Once again, case five stands out as the instructor used the SWBCS tools to meet the need of groups of students, who are working in various distant locations, to have a place to meet, discuss, and complete the required on-going group work. However, the tool set was not enough in this case as the students had many comments about how the system worked for them. Since the group rooms were not overseen by a moderator, and some of the students did not have access to the "game" software, they were often frustrated with how things worked. Solutions to most of these problems are readily available to put into place for the next offering of this course.

In case six, the instructor was using the system to determine if he could move his face-to-face class to a distance format without sacrificing some of the elements he felt were important. He needed to "break student's assisted mentality and thirst for detail" like he does in the face-to-face classroom and found this difficult in a purely asynchronous situation, without real conversations. Therefore he chose to use VOIP to implement conversations allowing for interactions between students and also with him.

***Question #5: What perceptions do students and instructors have regarding SWBCS?***

The results for this question utilized the following data collection methods; instructor surveys, interviews and focus groups, observation instrument, archival documents, and reflections from students. Table 11 shows an overview of the perspectives students reported through the end of semester survey.

Overall the students experienced few problems and felt the system was of high quality and assisted them in learning the materials presented in the class.

Table 11. Student Perceptions on Using a SWBCS

| Case | Student Perceptions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | ***Problems*** | ***Usefulness*** | ***Quality*** | ***Interactions*** | ***Structure*** | ***Learning*** | ***Community*** | ***Technology*** | ***Course*** |
| 2 | Minimal - none | Somewhat – very useful | Good - Excellent | 65%-effectve<br>77% - encouraged | 62% - Logical, easy to follow<br>73% - Approach effective | 62% - Facilitated understanding<br>50% - Demonstrate learning | 80% - more connected to students<br>77% - more connected to instructor | 65% - enhanced learning<br>54% - motivated to learn | 54% - excellent |
| 3 | Minimal - none | Very useful | Good - Excellent | 60%-effectve<br>60% - encouraged | 60% - Logical, easy to follow<br>80% - Approach effective | 100% - Facilitated understanding<br>60% - Demonstrate learning | 60% - more connected to students<br>60% - more connected to instructor | 60% - enhanced learning<br>60% - motivated to learn | 80% - excellent |
| 4 | Minimal - none | Somewhat – very useful | Good - Excellent | 100%-effectve<br>100% - encouraged | 100% - Logical, easy to follow<br>100% - Approach effective | 75% - Facilitated understanding<br>100% - Demonstrate learning | 100% - more connected to students<br>75% more connected to instructor | 25% - enhanced learning<br>75% - motivated to learn | 25% - excellent |
| 5 | Minimal - none | Somewhat useful | Fair - Good | 29%-effectve<br>14% - encouraged (57% *frequently*) | 29% - Logical, easy to follow<br>43% - Approach effective | 0% - Facilitated understanding (43% *rarely/not at all*)<br>0% - Demonstrate learning (43% *frequently*) | 14% - more connected to students (29% *frequently*)<br>0% more connected to instructor (29% *frequently*) | 0% - enhanced learning (57% *rarely/not at all*)<br>0% - motivated to learn (43% *rarely/not at all*) | 43% - excellent |
| 6 | Mixed Results - Minimal | Somewhat – very useful | Fair - Good | 17%-effectve<br>0% - encouraged (50% *frequently*) | 33% - Logical, easy to follow<br>33% - Approach effective | 17% - Facilitated understanding (33% *rarely/not at all*)<br>0% - Demonstrate learning (33% *sometimes*) | 0% - more connected to students (50% *rarely/not at all*)<br>17% more connected to instructor (50% *rarely/not at all*) | 0% - enhanced learning (50% *rarely/not at all*)<br>0% - motivated to learn (50% *rarely/not at all*) | 0% - excellent (50% *frequently*) |

The overall perceptions of the instructors were evident from the end-of-course survey, which provided additional data to support the previous findings. There were five categories of multiple-choice items (perceptions of overall student outcomes, overall systemic issues, satisfaction with course as a product, overall satisfaction, and tools used) and 12 open-ended questions. Generally, the five instructors that responded to the survey were positive about the experience both for themselves and for their students. Table 12 shows the summary of results for each category in percentage.

Table 12. Summary of Results from Faculty End of Course Survey

| Category | Very Dissatisfied | Dissatisfied | Satisfied | Very Satisfied |
|---|---|---|---|---|
| Perceptions of student outcomes | 0 | 6% (n=2) | 31% (n=11) | 63% (n=22) |
| Overall systemic issues | 0 | 13% (n=7) | 37% (n=20) | 51% (n=28) |
| Satisfaction with course as a product | 0 | 3% (n=1) | 17% (n=5) | 80% n=24) |
| Overall satisfaction | 0 | 0 | 40% (n=4) | 60% (n=6) |

Positive perceptions for overall student outcomes and satisfaction with the course as a product were reported. Overall instructors were very satisfied (60%) or satisfied (40%) with their technology teaching experience with Elluminate Live!™. More importantly, the open-ended responses showed that all five instructors intend to continue to use synchronous software in their online courses and will continue to expand their teaching strategies to take advantage of these new tools.

More in-depth discussion of the student perceptions for each case helps identify the approaches that students felt were more productive and useful for their learning environments. For example, in case 2 students had positive perceptions about the ability that SWBCS have to increase academic and social interactions. Results showed that students felt that the added tools provided more opportunities for connections and decreased transactional distance. The instructor also had positive perceptions and is currently using the system again.

Again, in case three, both the students and the instructor had positive perspectives about the use of the SWBCS in their course. Most saw the tools in the SWBCS as high quality and very useful. As the students became more comfortable with the new technology, they made comments about how well they liked this form of communication to support their learning. An example of this comes from an asynchronous discussion setup by the instructor where a student commented, “The second meeting was incredibly powerful! It's undoubtedly the way of the future. The meetings provide a larger insight into our eventual way of communication as administrators. It was interesting and very informative. It's only nerve-wrecking (a bit) because of its element of novelty. Soon it will become second nature. It's critically important that you continue providing the experience to others. I believe it's Helen Keller who so appropriately stated, "Life is a daring adventure or it is nothing."”

Although some of the perceptions in case four were lower than the first two cases, students portrayed positive perceptions toward the ability of the software to increase the interaction they had with the instructor and others in the class. The majority of the students reported that the sessions provided opportunities for effective interactions with their classmates and/or the instructor, which allowed them to

make better connections with all involved. In addition, they stated that synchronous sessions helped to motivate them, enhanced their learning, and allowed them to demonstrate their knowledge. The instructor had similar positive perceptions and plans to use the system in the future.

Unfortunately, the perceptions of students in cases five and six were not resoundingly positive. The student perceptions for case 5 were less positive and more mixed, stating different aspects that did not work as well as they would have liked. The instructor was and continues to be positive about the use of the SWBCS, as "excellent for allowing interactions between professor and students and amongst students when they are located at a distance. I hope to integrate its use into more of my distance courses." However, he only rated the use of the system in his course as "moderately successful" and would change the way in which it was used the next time he uses it. Even with this said, he was positive that he would use it next time.

The students in this case 6 did not have positive perceptions about the use of the SWBCS in their learning process. They had good perceptions about the software itself and were not thrown by the technology, but they did not feel it was helping them to learn or that the sessions were particularly useful to them. This may be due to the fact that the students were not truly distance learners, but were instead students playing at being distance students for the purposes of testing this system. The instructor had positive perceptions and plans to continue to use the system with his distance students. He may not however try a hybrid situation again without a great deal of practice and preplanning.

**Similarities and Differences Between Cases**

Another approach to looking at the results is to examine the differences and similarities between the cases (Figure 4). All cases but one (case five) had high levels of interaction and structure, yet two of the cases still had very low student perceptions (case and case six). The results for cases two and three appear appropriate, but cases four, five and six are somewhat different than would be expected based on some of the categories reported.

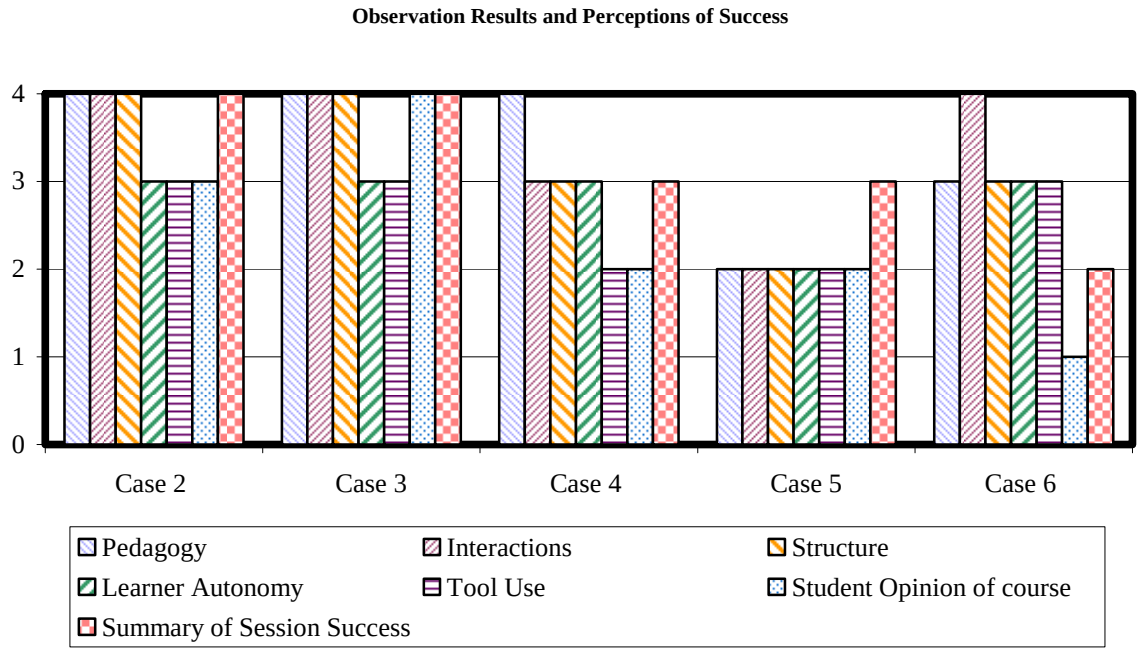


Figure 4. Observation Results and Students' Perceptions

Looking at similarities, those cases with high student perceptions used similar strategies and tools which increased interactions not only among the students but also between the students and the instructor. Almost all of the cases with high student perceptions used some form of lecture and discussion to engage students. These interactions seem to have stimulated effective learning environments and increased the sense of community the students felt, resulting in higher student perceptions. All but one of the cases had significant structure to the sessions, which seemed to enhance their success. Generally, all cases that were successful met the requirements and expectations of the instructors utilizing familiar strategies.

Certain differences were also obvious, especially in the manner in which the tools were implemented in the cases. Three of the five cases (two, three, and six) used the system tools extensively, capitalizing on the strengths of the synchronous classroom. Two of the six cases (four and five), although still deemed successful by observers, were noted by the observers to use a limited "variety" of tools (see Table 10). In both these cases, observers felt the sessions could have been improved by utilizing more of the features of the system. Case five had low student perceptions. In contrast, case 4 used the least tools, but had some of the highest student perceptions with 100% of the students reported they were able to demonstration learning. As noted before, this case had a simple structure and high dialog, which aligns with transactional distance theory.

For cases five and six, a probable reason for some differences in student perceptions is the actual structure of these courses. For example, case six was a blended course, not completely online with students in both the face-to-face classroom and online at the same time. Case five had a similar makeup with some students participating on campus and others from a distance. The student groups consisted of a combination

of on campus students and distance students, but some students actually attended the lectures in person. Both of these courses show lower student perceptions. It is possible that the students in these courses did not need the additional resources that were provided by the SWBCS as much as those participating completely from a distance.

Two cases stood out in their use of strategies that encouraged more learner autonomy. This was not evident in the learner autonomy category of the observation instrument (see Figure 4), but discussion of case studies and extensive group work both require a great deal of learner autonomy. In both of these cases students engaged in student centered strategies with little or no prompting from the instructor while continuing discussions of case studies and using breakout rooms for completion of weekly and semester long group projects. The results of student perceptions are enlightening in case four, where the instructor was available and students reported high satisfaction. The students in case five, in which the instructor broke them into breakout rooms and then usually left the SWBCS, had lower student perceptions. This would lead one to believe that the instructor is still very important, even in strategies that require high learner autonomy.

**Conclusion**

The results from this research can not be generalized. However, they offer a comprehensive overview of several cases from a variety of perspectives and provide areas for further research. Using synchronous software can be a daunting step for even an experienced distance educator. However, since learners throughout the world stand to benefit from the use of such tool, it is important that methods are tested and guidelines created to assist the distance educator in successfully implementing them. This investigation focused on five research questions regarding the use of syncchronous tools. The richness of data laid the groundwork for future investigations into the use of SWBCS in distance education from the perspective of effective teaching strategies and successful use of synchronous online tools.

Additionally, this research provided a glimpse into the complex nature of technology used for two-way communication in a learning environment that is real time and multifaceted. Hopefully these findings will lead us to additional discussion and research on best practices for using synchronous technologies for building learning communities and providing successful distance education courses with lower levels of transactional distance.

In general, the results of this research support the use of synchronous web-based course systems to supplement existing distance courses, allowing educators to build connections with and among students more efficiently and increase the potential for interaction in the online classroom. In addition, these data provided the initial framework for the development of a set of guidelines to support the planning and use of SWBCS in higher education instruction.

**References**

Burge, E. J., & Howard, J. L. (1990). Audio-conferencing in graduate education: A case study. *American Journal of Distance Education, 4*(2), 3-13.

Galusha, J. M. (1997). Barriers to Learning in Distance Education. Interpersonal Computing and Technology, 5(3-4), 6-14.

Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical Thinking, Cognitive Presence, and Computer Conferencing in Distance Education. American Journal of Distance Education, 15(1), 7-23.

Hara, N., & Khling, R. (1999). Students' Frustrations with a web- Based Distance Education Course. First Monday, 4(12)

Harasim, L. M. (1990). Online education: perspectives on a new environment. New York: Praeger.

Hillman, D. C. A. (1999). A new method for analyzing patterns of interaction. *American Journal of Distance Education, 13*(2), 37-47. from the ERIC database.

Hillman, D. C., Willis, D. J., & Gunawardena, C. N. (1994). Learner-interface interaction in distance education: an extension of contemporary models and strategies for practitioners. *American Journal of Distance Education, 8*(2), 30-42.

Jung, I. (2001). Building a theoretical framework of web-based instruction in the context of distance education. *British Journal of Educational Technology, 32*(5), 525-534.

Kubala, T. (1998). Addressing Student Needs: Teaching on the Internet. T H E Journal, 25(8), 71-74.

Lockett, K. (1998). The Loneliness of the Long Distance Learners? Using Online Student Support to Decrease the Isolation factor and Increase Motivation. webNet98 World Conference, Association for Advancement of Computing in Education.

McIsaac, M. S., & Gunawardena, C. N. (1996). Distance education [electronic version]. In D. H. Jonassen (Ed.), Handbook of research for educational communications and technology: a project of the association for educational communications and technology (pp. 403-437). New York: Simon & Schuster Macmillan. Retrieved July 15, 2004, from http://seamonkey.ed.asu.edu/~mcisaac/dechapter/

McIsaac, M. S., Blocher, J. M., Mahes, V., & Vrasidas, C. (1999). Student and Teacher Perceptions of Interaction in Online Computer-Mediated Communication. Educational Media International, 36(2), 121-31.

Moore, M. G. (1989). Three types of interaction. *The American Journal of Distance Education, 3*(2), 1-6.

Moore, M. G., & Kearsley, G. (1996). Distance education : a systems view. Belmont: Wadsworth.

Patton, M. Q. (2002). Qualitative evaluation and research methods (3rd ed.). Thousand Oaks, California: Sage Publications, Inc..

Sherry, A. C., Fulford, C. P., & Zhang, S. (1998). Assessing Distance Learners' Satisfaction with Instruction: A Quantitative and a Qualitative Method. American Journal of Distance Education, 12(3), 4-28.

Tabs, E. D. (2003, July). *Distance Education at Degree-Granting Postsecondary Institutions: 2000–2001* (NCES 2003–017). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Vrasidas, C., & McIsaac, M. S. (1999). Factors Influencing Interaction in an Online Course. American Journal of Distance Education, 13(3), 22-36.

Willis, B. (1995). Distance Education Research Guide. University of Idaho, College of Engineering excerpted from Distance Education at a Glance. Retrieved July 15, 2004, from http://www.uidaho.edu/eo/dist1.html.

Yin, R. K. (1994). Case Study Research Design and Methods, Second Edition. Applied Social Research Methods Series Volume 5. Thousand Oaks, California, Sage Publications, Inc.

**Acknowledgements**

This work was supported, in part, by the University of South Florida and the Fund for the Improvement of Postsecondary Education, under Grant No. P339Z000006. A total of $2,774,950 in federal funds was provided for the project, representing 50% of the total project costs. The remaining 50% of the project costs ($2,774,950) was financed by nonfederal sources. The opinions expressed are those of the authors and do not reflect the views of the United States Department of Education or the University of South Florida.