Synchronous E-Learning: Analyzing Teaching Strategies

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Abstract: The purpose of this study was to investigate the use of synchronous e-learning tools as a supplement to existing methods and strategies employed in online courses at a major university. Eight faculty members participated in the study, incorporating four sessions of either Elluminate Live!™ or HorizonLive into their university courses. Data were collected from student and instructor surveys, instructor and support personnel interviews and focus groups, direct and participant observation, analysis of event logs and archival records. The results of the 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.

Introduction

As more courses are offered online, the search for tools and techniques that can enhance learning continues. Synchronous software offers great potential to enhance distance education. Synchronous tools that are common include Voice Over Internet Protocol (VOIP) to conduct two-way audio conversations; electronic chat rooms and instant messaging for text-based communications, polling and feedback tools for instructors and students, presentation areas for PowerPoint, group break out rooms, and application sharing. Although challenges exist for using synchronous software in an online course, these tools hold the potential to enhance the distance learning experience with increased interaction, immediacy, social presence, group work, and collaboration.

Learners throughout the world stand to benefit, as optimal strategies for teaching in this environment are developed, tested, enhanced, and shared. This research investigated synchronous online learning classrooms as a means to allow distance educators to build connections with and among students more efficiently and to increase the potential for interaction. Research of this nature, while in its infancy, is very important to the distance education communities in higher education, K-12, and industry as technology continues to improve and become feasible in these educational settings.

Theoretical Framework

Current distance education literature provides insight into two major issues facing educators today; 1) challenges in providing optimal interaction, both course related and social, and 2) a lack of proven pedagogical strategies conducive to learning in synchronous environments. Both of these issues need to be addressed by educational researchers.

Distance Education research emphasizes the importance of interaction for effective teaching (Garrison, Anderson, & Archer, 2001; Hillman, 1999; Moore & Kearsley, 1996; Vrasidas & McIsaac, 1999). Studies indicate that interactions between students and instructors and student-to-student interactions greatly enhance education at a distance (Harasim, 1990; Hillman, 1999; Willis, 1995; Moore, 1989). In addition, social interactions required for students to be successful learners are frequently missing (Galusha, 1997; Hara & Khling, 1999; Kubala, 1998). Educators often use asynchronous computer mediated communication to address these problems, but these methods are still insufficient and others need to be investigated. Well-planned pedagogical strategies are needed as instructors integrate synchronous tools.

Method

This study employed a rigorous blend of research methods that examined instructors, students, and support teams to gain a good understanding of the use of synchronous software. Data were collected using student and instructor surveys, instructor and support personnel interviews and focus groups, direct and participant observation, analysis of event logs and archival records.

The university licensed working versions of both Elluminate Live!™ and HorizonLive™ software packages. All faculty were invited to participate in the pilot test of these programs. For the study, purposeful sampling was used to select eight instructors with unique teaching styles and experience as distance instructors. The instructors in this study taught in the College of Nursing (1), the College of Engineering (2), Library and Information Sciences (2) and the College of Education (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. All were teaching at least a portion of their course online and had varying levels of experience in distance education. One instructor was based on a remote campus. Prior to implementation, instructors were trained on the use of the synchronous software of their choice. One training session was conducted in a classroom; the other three sessions were conducted synchronously, over the Internet.

To facilitate delivery, each instructor was provided with a "producer" during their "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 observation.

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 experience as well as demographics. The second survey examined the perceptions that students held after using the synchronous software throughout the semester. Instructors took an end of the semester which examined the faculty's perspectives as well as how they ultimately utilized the synchronous environment in their courses.

In addition to the end-of-course surveys, each instructor was interviewed after the training sessions, yet prior to course delivery. Questions focused on the anticipated advantages, challenges, and concerns with implementation of synchronous software.

An instrument was developed 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. Using a checklist and a set of guidelines, recorded class sessions were rated by six independent reviewers. The design and implementation of this instrument was iterative. Although the final version had good inter-rater reliability, complete agreement was reached through discussion of each question with less than 80% agreement.

Additional data were collected in the form of documents which included email, discussion board postings, training materials, support documentation and a researcher's journal. These documents were generated by faculty, students, producers, technical support personnel and the research team. They include both positive aspects of the project as well as problems and troubleshooting. 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 and the success of the pedagogical strategy used, as well as perceptions of those involved. The 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

This course was taught by a full professor with 14 years of experience teaching in higher education and approximately 10 years via distance. She regularly teaches graduate-level courses in multimedia, instructional design, web design, and telecommunications, many at a distance. 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 mind set at the beginning of

the study. Although she was an experience distance instructor, she had not used a synchronous classroom to teach before. However, she was open minded to the possibilities and excited about the experience.

This semester, 18 students were enrolled in the course. Eleven of the 18 students responded to the initial survey providing background information and demographics for the study. Student age 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 5 reported a variety of fields (i.e., education, business education, recertification of teaching, English, and communication). Students' distance from campus varied with 54.4% living less than 30 miles away and 36.4% 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 (9.1%) 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 to use for the class, the results showed that all computers were adequately prepared.

Although the 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 4 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 1 reflects the proficiency levels students reported with various types of software.

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

Table 1: Distribution of Student Self-Reported Software Proficiency

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 of a full synchronous online classroom. Overall, there was little previous experience before this course for students in this class.

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 was not offered in an online format while only two stated they would *likely* or *definitely* take it regardless of format. Students were also 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, 8 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 2).

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

Table 2: Frequency and Severity of Problems Reported with the Synchronous Classroom

Students' level of technical skills and the amount of technical support available impacts students' perceptions about their ability to use the interface. When asked whether technical knowledge and skills were required to master the use of Elluminate Live!™, students had mixed feelings. However, 41.7% stated that these skills were important at least *frequently* or *almost always*. Most students (50% selected *rarely*) did not need technical assistance to complete the synchronous sessions. However, 25% felt they *almost always* needed help. When they did need technical support, 33.3% said it was *almost always* available (66.7% answered *not applicable*). Those who accessed technical support (25%) said it was *almost always* able to solve their problems.

In order to determine the success of the tools used during the sessions, the students were asked how useful each feature was to them. With the exceptions of application sharing and guided web surfing, the majority of students reported that all features were very useful (Table 3).

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

Table 3: Reported Usefulness of Features in the Synchronous Classroom

In addition to ratings of the usefulness of features, the students' perceptions of the quality of the synchronous software were measured (Table 4). 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'*. In addition 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.

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

Table 4: Student Ratings of Quality of the Synchronous Classroom

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 knowledge and learn. 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 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.

Description of observation instrument

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. In Jung's 2001 study, he 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, we looked at many different aspects of the course (See Figure 1).

An observation instrument was created based on this theoretical structure and traditional classroom observation instruments. The instrument consisted of yes/no indicators that are each coordinated with an open-ended comment area for description or explanation. These questions fall 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 begins with a definition of the category and ends with an open-ended summary area. Within each category, directly observable as well as judged items were reported.

The instrument was put into an online survey format to make data collection and reduction easier. This instrument was developed through many iterations 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. A total of six observers were involved in the final stages of reliability testing. The last iteration was finalized using the case reported in this paper. The resulting item inter-rater agreement coefficients (Figure 2) 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 now agree 100%. This iterative process proved valuable and the final version of the instrument was used to examine all remaining cases.

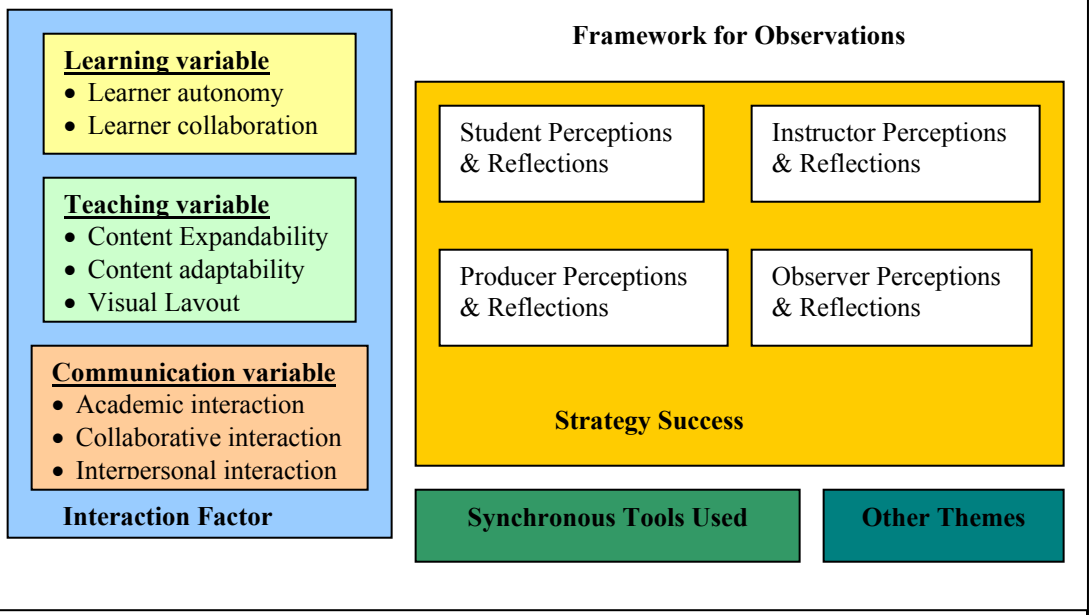

Figure 1: Theoretical Framework based on Jung (2001), Moore (1989), Hillman et. al. (1994) and implementations of pedagogical strategies in a synchronous online classroom.

Stem	Leaf
10	00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
9	
8	00000000033333333333333333333333333
7	5555
6	0000777777777777
5	000
4	

Figure 2: Stem-and-Leaf Plot of Item Level Inter-Rater Agreement Coefficients

Summary of Observations

The results of the observation for this case supported the finings from the student surveys and showed the session observed was successful. Strengths seen by the observers that led to a successful session in this case include a variety of indicators, however the most common focused on the organization and well planned structure of the session. Other strengths included; 1) clear learning objectives, 2) students actively engaged by the activities promoted an effective and positive learning environment, 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 very appropriate for the venue.

Weaknesses mentioned were few, which supports the determination that this was a successful session. Items observed in the lesson 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 a community may develop over time (in more than one class session).

The pedagogical strategies were 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 student's 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 student's 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 student's 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. The variety of tools were used to present material produced a successful session.

The end-of-course survey for instructors 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. Overall the five instructors that responded to the survey were positive about the experience both for themselves and for their students. 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 show 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.

Conclusion

Using synchronous software can be a daunting step for even an experienced distance educator. However, learners throughout the world stand to benefit from the use of such tools. Therefore it is important that methods are tested and guidelines created to assist the distance educator in successfully implementing these tools. The data provided in this study offer an initial framework for the development of a set of guidelines to support the planning and use of synchronous software in higher education instruction.

In general the results of the 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.

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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. 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.