
Distance Synchronous Information Systems Course Delivery

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Abstract

Teaching computer information systems via distance education is a challenge for both student and faculty. Much research work has been performed on methods of teaching via distance education. Today we are faced with a variety of options for course delivery. Asynchronous delivery via online or lesson instruction still remains most common. But alternative synchronous delivery methods such as Adobe Connect, Skype, and Eluminate Live are increasingly used as alternatives in a variety of situations and for a variety of purposes and classes. Our study reviews the use of synchronous distance course delivery and reports on specific experiences and results from two computer information systems courses over the past year. Post-class surveys from the students of these courses reveal interesting and useful insights into the acceptance and challenges of synchronous distance delivery methods including emphasis on technical stability and interaction.

Keywords: online teaching, distance education, computer information systems education, synchronous delivery, Adobe Connect

1. INTRODUCTION

Distance education has become a significant force in post-secondary education in the United States. In the 2006-7 year, 66% of two and 4 year post-secondary institutions offered "online, hybrid/blended online, or other distance education courses" (Parsad and Lewis, 2008). According to the U.S. Department of Education, National Center for Education Statistics (2003), there were 2,876,000 enrollments in college-level, credit -granting distance education

courses with 2,350,000 undergraduate enrolments and 510,000 graduate enrolments. About 0.8 million, or 4 percent of all undergraduates, took their entire program through distance education. And most of these courses are offered online via the Internet in an asynchronous mode (90 percent). More recent information suggests how much this has grown. In 2007-8, there were 118,100 different courses offered, 89,600 of these were undergraduate and 27,500 were graduate. About 4.3 million undergraduate students, or 20 percent of all

undergraduates, took at least one distance education course (National Center for Education Statistics, 2011). But this phenomenal growth has not come without some issues. Concern has been expressed on the quality of distance education vis-à-vis traditional education. There have been many failures in distance education programs (NEA Higher Education 2002). But research has shown that done properly distance education can provide results similar to traditional education (Wegner, Holloway, and Garton 1999). Clearly, there are variables that affect the success or failure of a distance education course. One of those variables is the use of synchronous versus asynchronous delivery methods. This paper will review this area. First, we briefly review literature on distance education. Second, will be a brief review of Synchronous delivery literature and Adobe Connect implementations. Next, the authors will recount their experiences at their University with Synchronous delivery methods and results. Finally, the authors will explore various hypotheses on variables influencing suitability and likely future use of synchronous delivery methods via Adobe Connect.

2. REVIEW OF THE LITERATURE

Distance Education

Many authors have attempted to understand the reasons for success or failure in an online and/or distance education course. As a result, many factors have been proposed as important in determining whether a student will succeed or fail in an online distance education course. Alley and Jansak (2001) discuss key concepts in online success but first propose three levels of educational hierarchy. The first is a set of principles that are independent of learning environment or situation. They are the basic concepts that all knowledge transfer is based on. The second level is practice, which is specific to a type of delivery mode such as classroom or distance education. The final level is application specific, which deals with the unique situations in a particular course. This manuscript discusses general online variables that are at the second practice level as well as specific application situations and techniques that have proven successful in trying to teach information technology via distance education.

As noted, there has been an explosion in distance education courses and students over the past decade. The number has grown from 2.8 million students to 4.3 million students in

only a six to seven year span from 2000 to 2006-7. And the number continues to grow. Many factors have contributed to this growth including flexibility for students, expanding access for students, and expanded course offerings (Bernard, Abrami. et. al. (2004) The economic pressures of today's economy and the rising cost of higher education have resulted in more and more traditional students needing to work during the school year to meet their financial obligations. As a result, work schedules often conflict with classes and students require the flexibility of distance education. Many students with disabilities are limited in their ability to meet in traditional settings. Distance education expands these opportunities. With distance education, classes can also be aggregated over greater geographical distances, allowing for a school to offer more varied and extensive course offerings than they have been able to if limited to only co-located students. Fabian (2008) suggests that travel is a significant factor in the move to online education with 79% of students living off-campus. The ability to attend class via distance methods and technologies reduces travel time and cost and provides an effective method to reduce overall energy consumption.

Advantages accrue to students, teachers, and the community at large. But one of the fundamental questions is whether distance education can provide the same quality of education as traditional classroom instruction. In one of the most comprehensive studies performed, Bernard, Abrami. Et. Al. (2004) performed a detailed analysis of distance education versus classroom instruction via a meta-analysis of 232 studies. Their overall conclusion was that there was little difference in education achievement between distance education and classroom instruction. To restate, after reviewing 232 separate studies on student achievement, there was found to be no significant difference between distance and classroom learning.

For distance education courses to be successful however, there are certain elements that must be present in the course design and development. Eastmond's (2000) findings focus on three primary areas – course design, support, and proficiency. Course design is critical to successful Internet course delivery. The factors that are advantages in distance education via online delivery, interaction, collaboration, hands-on learning, and reflection, all must be clearly

and explicitly included in the overall course design. These do not just occur naturally in distance education, they must be explicit. Support in the form of individualized communications or help must be aggressively pursued. Again, it will not just naturally occur in an online environment. Finally users must be fully proficient in the technological delivery methods of the course or the course will fail. For information technology professionals or students, this may not seem to be an issue but even the most gifted students can be confounded by obscure and difficult to use interfaces and assignments.

Soong, Chan, Chua, and Loh (2001) performed a limited survey of students in three online courses to determine success factors in these courses. The authors analyzed results and proposed five factors that positively influenced results in online courses.

Human issues – Instructors must be skilled in motivation and adequately prepared for the online setting. They also must foster an enthusiastic environment.

Technical skills – Both the instructors and the students must understand and be able to easily use the systems.

Technical help – Help must be available to support the students if there are difficulties in utilizing the course website or resources.

Collaboration – High levels of successful communication and collaboration are strong indicators of success.

Mindset – Both the students and the instructors must view the online learning process positively.

Stidham and Frieden (2002) echo many of the concepts put forth by other researchers. Their success factors focus around the primary areas of content, communications, support, preparation, performance, and small class size. Content should be developed based on knowledge already possessed by an instructor. This may include the conversion of a traditional course to online delivery. Preparation is work that needs to be accomplished by the instructor as well as the student. The instructor may visualize the delivery of the course or its conversion from traditional methods. Communications in an online course are vital and should be easy as well as accurate. Brevity

and clarity are also traits that should accompany successful online delivery.

Piercy (2000) studied the concept of teaching gerontology through distance education and found several successful strategies in this educational endeavor. These successful strategies centered on preparation, rapport, communications, and technical support. Piercy (2000) along with many other educators found that significant and different preparation was involved in developing and conducting an online class. Detailed syllabi, review of technological tools, and extended support materials all were needed. Communications are key again but Piercy (2000) emphasizes the two-way nature of communications, as well as timely feedback. Finally, for the course to be successful the technology must be successful and this includes ease of use, reliability, and accessibility of support.

Hillesheim (1998) recognizes three problem areas for distance education and proposes strategies for improvement. These problem areas are student issues, student/faculty relationships, and technology itself. Some of the areas of student issues include student attitudes and expectations, time management, and need for feedback. The author suggests that many of these personal issues can be dealt with through proper acceptances and then proper orientation. Faculty issues include responsibility, support, and encouragement. Faculty need to be encouraged to get students' attention, foster feedback, and successfully guide learning through proper presentation among other suggestions. Technology issues suggest the need for a proper environment to conduct the distance education class.

Wang (1994) reviews the literature of the time on distance education and suggests two key factors for distance education support, instructional materials and technological environment and support.

Meyen, Tangen, and Lian (1999) suggest that online courses have two significant areas that need to be addressed namely instructional features and support features. The instructional features include items such as lectures, notes, readings, activities, projects and exams. The support features include syllabi, technical support, and rosters. The authors suggest that the unique nature of online courses requires special detail in each of these areas.

Hara and Kling (2000) surveyed students and their problems with distance education and found that the major problems were lack of instructor feedback, ambiguous instructions and lessons and technical problems.

There are a variety of delivery methods for distance education but as suggested in this review, technology stability and support as well as interactive course design are both critical to course success. Beldarrain (2006) suggests interaction should be used as the "foundation of effective education practices."

Synchronous Delivery and Adobe Connect Literature Review

In general there are two primary categories of distance education delivery: Asynchronous and synchronous.

Asynchronous delivery is the traditional form of distance course delivery and began nearly a century ago with correspondence course delivered via the US mail system. A student would be sent study materials and exams and return completed work for review and grading. A student could review and study materials at a time convenient to them and return materials when completed. This method had limited market penetration and was confined primarily to trades and crafts. Some expansion of this approach included videos and/or audio tapes when these technologies became common. With the introduction of the Internet however, course design and delivery became more flexible and popular. Traditional online asynchronous courses are delivered via the Internet to students across the globe and as with all asynchronous instruction, students can review materials at their convenience and submit work, test, or projects via the Internet.

By contrast, synchronous distance education is a relatively new phenomenon. With the development of video and audio conferencing tools, students at a distance can now receive live real time feed of instruction simultaneous with resident instruction at a specific location. This generally requires a student to be present with a computing device at a specific time and place.

There are advantages and disadvantages to each of these distance education approaches. Brannon and Essex (2001) found advantages and disadvantages for both asynchronous and synchronous technologies for distance

education. "Reasons for using synchronous communication included: holding virtual office hours, team decision-making, brainstorming, community building, and dealing with technical issues. On the other hand, distance educators have found asynchronous communication to be helpful for encouraging in-depth, more thoughtful discussion; communicating with temporally diverse students; holding ongoing discussions where archiving is required; and allowing all students to respond to a topic. Both types of communication have their disadvantages, however. Disadvantages of synchronous communication include: getting students online at the same time, difficulty in moderating large-scale conversations, lack of reflection time for students, and intimidation of poor typists. Educators also cited the limitations of asynchronous communication: lack of immediate feedback, students not checking in often enough, length of time necessary for discussion to mature, and students feeling a sense of social disconnection."

Much study has been specifically done on asynchronous education implementations but less work has been accomplished on synchronous distance education.

A literature review was accomplished on the use of synchronous distance delivery and the most common tool used for synchronous delivery, Adobe Connect.

Dammers (2009) suggests the use of synchronous video conferencing tools is a new but growing area for distance education. Prior to this time these video conferencing tools were primarily used for business and other organizational meetings.

Wang (2008) performed a qualitative study and found that general levels of satisfaction with synchronous webinar delivery tools such as Eluminate and Adobe Connect. He found advantages of social presence and multi-level interaction. He noted advantages of synchronous online webinars as reduction of travel time, students learn in their own environment, and "near face-to-face interaction with the instructor and other participants." Wang (2008) also found technical issues such as delay or transmission interruption as one of the major issues in using online synchronous teaching tools.

Blackwell (2009) saw some of the advantages of Adobe Connect as ability to record classes for

later review. Blackwell (2009) also noted the need to accept minor technical glitches and that students need to be active participants to get the most from online synchronous courses. Karabulut and Correia (2008) suggest Adobe Connect as one of the highly recommended tools for online synchronous course delivery. Some of the advantages they suggest include rich multi-media abilities, cross platform compatibility, ease of use, and level of customization. Davidson (2007) notes the growth of online education at New Mexico Tech due to the incorporation of Adobe Connect synchronous tools in their online course delivery.

Falloon (2011) suggested positive benefits to Adobe Connect virtual classrooms including promotion of quality dialogue among students. Armstrong, Morris, and Solomita (2008) also suggest areas for success include faculty training, student training, available technical support, training for all technical individuals, and good audio, video, and systems infrastructure. Bos (2011) performed a study and found that Adobe Connect can be successful and flexible environment for learning in the 21st century. The author performed a study based on Masters level elementary education students. Advantages included flexibility, interactivity, collaboration opportunities, and freedom to speak their mind from their own environment. Disadvantages noted were mainly focused on technical issues.

Fuest (2007) developed a six month project on the use of Adobe Connect in the classroom. He suggests some specific guidelines for success including tool training, content preparation, standard course layouts, clear agendas, and assurance of technical support. Buchman and Murray (2013) studied the use of Adobe Connect for teaching rural Appalachian students. There were generally favorable results but some limitations noted were network issues, microphone echoing, and the possibility of audio interference. All these were technical issues.

Though not much work has been done comparing the two options, Offir, Lev, and Bezalel (2008) found higher levels of achievement in their study of synchronous versus asynchronous distance education.

3. COURSES DELIVERED

There was a desire on the part of our University to explore the use of distance education technologies to address low enrolled classes at a

campus location as well as to provide a cross-regional educational experience for our students. As noted Offir, Lev, and Bezalel (2008) found higher achievement via synchronous course delivery. They also found Adobe Connect to be successful and flexible. Based on this and our full literature review, it was decided we would use Adobe Connect for two upper level classes at our campus location. The courses would be taught live in the Fall of 2012 and simultaneously broadcasted via Adobe Connect at least two other campuses. The courses decided upon were IST 331 and IST 412. Course descriptions are as follows.

IST 331 Organization and Design of Information Systems: User and System Principles (3) Interdisciplinary survey of topics related to the use and usability of information systems.

IST 412 The Engineering of Complex Software Systems (3) Introduction to the engineering of complex software systems including software system specification, design and implementation, integration and test, and evolution.

The courses were delivered by two different instructors over the Fall semester. In general the courses were a success. Some general issues that rose up over the semester included the following.

- Technical stability is paramount. Adobe Connect can be a finicky application. Many times during the semester and often during each class, Flash would crash requiring a reopening of the Adobe Connect interface. Though this takes little time, it proved to be a frustrating experience for students as well as the instructor.
- Be careful with scrolling through presentation documents while using Adobe Connect. This rapid video change seemed to exacerbate the Flash crashes.
- There is a significant time lag on audio, therefore for those at a distance the inclusion of headsets as a key component of the student setup is essential.
- Wireless Internet access on the part of the students appeared to be less stable than wired Internet.

But more importantly, after our course we performed a detail survey to determine what variables affected the overall acceptability of this

type of course by our students. The model we developed examined a variety of variables and their possible effect on overall suitability of Adobe Connect for the course and subsequent interest in future usage of Adobe Connect. The model is shown in Figure 1 (See appendix).

4. HYPOTHESES

The specific variables in the model were based on literature review. Our independent variables are the tools or environment in which our online teaching tool worked. Our dependent variables all related to acceptance and preference for the technology. As noted, the online teaching tool we studied was Adobe Connect.

Hypothesis 1

Ease of use of online teaching tools will significantly influence overall suitability of the tool for instruction.

Hypothesis 2

Technical reliability of online teaching tools will significantly influence overall suitability of the tool for instruction.

Hypothesis 3

Perceived quality of online teaching tools will significantly influence overall suitability of the tool for instruction.

Hypothesis 4

Perceived substitutability of online teaching tools versus face to face teaching will significantly influence overall suitability of the tool for instruction.

Hypothesis 5

Perceived interaction via online teaching tools will significantly influence overall suitability of the tool for instruction.

Hypothesis 6

Overall suitability of the online teaching tool for instruction will significantly influence future usage.

Overall then, we examined ease of use, technical reliability, perceived quality of the tool, perceived substitutability to classroom

instruction, perceived interaction, overall suitability, and future usage.

A survey was developed and administered to all students near the end of the class semester.

5. RESULTS

Overall the courses offered were deemed a success. Success was defined as a positive response to the suitability and usage rate questions. There were 20 respondents to the survey and the overall suitability rate and future usage rate were good as shown in table 1. On a scale of 1-5 with 1=strongly disagree and 5=strongly agree, overall suitability rated a 4.05, above agree and enrolling another course using Adobe Connect rated a 3.8, only slightly less than a 4.0 agree. We found this result to be strong given this was our first effort with this delivery mode.

	Mean
I feel this course is suitable for the interactive video medium using Adobe Connect.	4.05
I would take another course that was delivered via Adobe Connect (assuming the course is of interest).	3.80

Table 1 Overall Acceptance of Adobe Connect

As our next step, Regression analyses using SPSS 20.0 was performed on the survey results to determine variables affecting overall suitability and the suitability impact on future use. We wanted to find out what was important to our students and where we might need to focus and/or improve. The specific questions answer were as follows.

The software used in these courses (Adobe Connect and ANGEL, *which is our University's Course Management System*) allows sufficient opportunity to interact with my instructor and course mates. In general, the quality of the audio reception for the students' voices is clear, Rate the reliability of the course delivery system used in this Adobe Connect course (reliability is the probability that the software will perform its prescribed duty without failure for a given time)., , In general, the volume level of the audio is satisfactory, In general, when viewing presentation material from the instructor

(shared screen, PowerPoint, other documents), the clarity of the video is satisfactory., In general, the quality of the audio reception for the instructor's voice is clear., This medium (Adobe Connect) is a suitable substitute for having an instructor physically present at my site.

The responses to the questions were used to test each research hypothesis. For each of the first five variables, the dependent variable was: I feel this course is suitable for the interactive video medium using Adobe Connect.

Hypothesis 1 Ease of use of online teaching tools will significantly influence overall suitability of the tool for instruction.

There were two questions asked that addressed ease of use: I am able to connect to the Adobe Connect course meeting room easily. The Adobe Connect software is easy to use. As shown in Tables 2 and 3, neither of these ease of use variables had a significant impact on use and future use at $p < .05$. We therefore suggest that ease of use is not a factor in acceptance of the technology and reject research hypothesis 1.

Model	Unstandardized Coefficients	
	B	Sig.
1 (Constant)	3.168	.001
1 The Adobe Connect software is easy to use	.218	.293

Table 2 Easy to Use

Model	Unstandardized Coefficients	
	B	Sig.
1 (Constant)	4.017	.000
1 I am able to connect to the Adobe Connect course meeting room easily.	.008	.963

Table 3 Connect Easily

Hypothesis 2

Technical reliability of online teaching tools will significantly influence overall suitability of the tool for instruction.

We next tested for the importance of the reliability of the software. Buchman and

Murray(2013) and Wang (2008) suggested that technical reliability was an important variable. As shown in table 4, we also found that technical reliability was a significant factor for suitability at $p < .003$. Hypothesis 2 was accepted.

Model	Sig.	
	B	
1 (Constant)	2.326	.000
1 Rate the reliability of the course delivery system used in this Adobe Connect course (reliability is the probability that the software will perform its prescribed duty without failure for a given time).	.442	.003

Table 4 Technical Reliability

Hypothesis 3

Model	Unstandardized Coefficients	
	B	Sig.
1 (Constant)	1.838	.033
1 In general, when viewing presentation material from the instructor (shared screen, PowerPoint, other documents), the clarity of the video is satisfactory.	.253	.365
1 In general, the quality of the audio reception for the instructor's voice is clear.	.442	.068
1 In general, the volume level of the audio is satisfactory	.171	.465
1 In general, the quality of the audio reception for the students' voices is clear	-.329	.073

Table 5 Quality

Perceived quality of online teaching tools will significantly influence overall suitability of the tool for instruction.

Perceived quality of audio and video were studied via 4 questions and none of the variables showed significance at $p < .05$. This may be because the quality in both cases was not an issue. Hypothesis 3 could not be supported.

Hypothesis 4

Perceived substitutability of online teaching tools versus face to face teaching will significantly influence overall suitability of the tool for instruction.

If individuals viewed the online tool to be suitable versus face-to-face, they viewed the course as being suitable at $p < .015$. Hypothesis 4 was accepted.

Model	Unstandardized Coefficients	
	B	Sig.
(Constant)	2.669	.000
1 This medium (Adobe Connect) is a suitable substitute for having an instructor physically present at my site.	.373	.015

Table 6 Tool Suitability

Hypothesis 5

Model	Unstandardized Coefficients	
	B	Sig.
(Constant)	1.180	.085
1 The software used in this course (Adobe Connect and ANGEL) allows sufficient opportunity to interact with my instructor and coursemates.	.727	.000

Table 7 Interaction

Perceived interaction via online teaching tools will significantly influence overall suitability of the tool for instruction.

Those that Adobe connect provided sufficient interaction clearly correlated with overall suitability at $p < .001$. Hypothesis 5 was accepted. Piercy (2000) noted that interaction is a key component of successful instruction.

Hypothesis 6

Overall suitability of the online teaching tool for instruction will significantly influence future usage.

Finally, as expected those that viewed Adobe Connect as suitable are more likely to take another course via this technology. The dependent variable here was level of agreement with "I would take another course that was delivered via Adobe Connect (assuming the course is of interest)." Hypothesis 6 was accepted.

Model	Unstandardized Coefficients	
	B	Sig.
(Constant)	.187	.793
1 I feel this course is suitable for the interactive video medium using Adobe Connect.	.892	.000

Table 8 Suitable

The Adobe Connect software is easy to use	Not significant
I am able to connect to the Adobe Connect course meeting room easily.	Not significant
Audio/Video	Not significant
Rate the reliability of the course delivery system used in this Adobe Connect course (reliability is the probability that the software will perform its prescribed duty without failure for a given time).	Significant
This medium (Adobe Connect) is a suitable substitute for having an instructor physically present at my site.	Significant
The software used in this course (Adobe Connect and ANGEL) allows sufficient opportunity to interact with my instructor and coursemates.	Significant

Table 9 Summary of Results

Discussion of results

From our limited study, there are three questions that our student to have a significant impact on overall suitability of Adobe Connect for the courses delivered. In addition, there were three areas that did not show a significant correlation with suitability. The question with the largest impact was that Adobe Connect allows sufficient opportunity to interact with the instructor and coursemates. This suggests that the communication interchange is an essential component for successful distance education alternatives. The second significant variable was technical reliability. If the system or software crash, then the students soured on Adobe Connect suitability. Up-time is a key component of successful delivery. Finally, the view that a live instructor delivered remotely via Adobe Connect was a suitable substitute for a physical presence was a significant factor in overall suitability. This is a variable that may be strongly affected by age and gender and further study should be explored breaking down these demographic groups. The three areas that were found not to be significant were ease of use, audio/video, and ease of connection. It is postulated that these areas were not a problem for our students and as a result did not calculate to be significant.

Limitations

There are many limitations to this study. First, the study is a convenience sample of only two courses at our University. The study is meant as an initial attempt to explore possible issues and concerns involved in Adobe Connect distance education delivery. Further study is required to generalize these results across a larger population. Likewise, larger sample sizes are needed to attempt to develop a statistically valid model for Adobe Connect course delivery. The courses were upper level and should be expanded to freshman and sophomore courses. Additionally, there should be work done to compare results with on ground control delivery.

6. CONCLUSION

Our experiences with online distance education have been very positive and our results compared with my traditional undergraduate instruction appear to be similar. Student evaluations are similar as well. Overall, the experience of teaching online synchronous education has been interesting and worthwhile and results appear to be similar to classroom instruction. Our 20 students who responded to

the survey and took the course generally agreed that the courses were suitable for Adobe Connect and that they would take another course via this medium. The variables that were found to be significant to suitability were technical reliability, interactivity, and the perception that an online presence was an acceptable substitute for a live physical presence. Though not without its challenges and issues, synchronous online course delivery via Adobe Connect can be a successful endeavor for both students and faculty.

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Appendix

Figure 1 Synchronous Course Delivery Suitability Hypotheses

