

## **AC 2007-1785: REAL-TIME LEARNING IN A DISTANCE COURSE**

**Sorraya Khiewnavawongsa, Purdue University**

**Ron Leong, Purdue University**

**Edie Schmidt, Purdue University**

## **REAL-TIME LEARNING IN A DISTANCE COURSE**

## Abstract

Internet technology has been widely applied across several industries, including education. In addition to traditional classroom learning, web-based learning is another way to deliver a lesson to students, eliminating physical and geographical boundaries. Since web-based learning communicates through the Internet, it is generally a one-way transaction and instructors do not get the real-time interaction from students as in a classroom. This limitation can be eliminated through collaborative software, Adobe Connect Professional.

Unlike some other distant learning methods, Adobe Connect has some functions that improve communication between instructor and students during a lecture. First, it is equipped with audio and video capabilities. Students can see and hear an instructor as in a classroom. Another benefit is feedback from students. An instructor can ask a question and get responses back from students instantaneously. He/she can poll multiple-choice questions and receive answers from students real-time. If students have spontaneous reactions to an instructor's comment, the students are able to clarify, discuss or even debate the subject matter by typing their questions in a chat window. Therefore, students will participate more in a lesson than other distant learning methods.

In traditional classrooms, an instructor can present PowerPoint and other programs on a projector. Using Adobe Connect Professional, it allows an instructor to share his/her program window or computer screen so students will see the same screen as their instructor.

A previous paper studied the difference in learning effectiveness between Adobe Connect and traditional classrooms. Results were analyzed by two post-tests and a survey. However, the web-based method used was pre-recorded lecture. The major disadvantage of that method was that students could not communicate back to an instructor. In this study, the real-time method was performed to improve the communication. Pre-test, post-tests and surveys were conducted to evaluate if there was a significant difference between distant learning through Adobe Connect Professional and traditional classroom.

## Introduction

The student's ability to learn was measured using three dimensions: (1) ability to retain information, (2) ability to comprehend information, and (3) ability to meaningfully apply the knowledge. In a previous study, we were able to establish that there was no statistical difference in the learning progress between the group of students who attended a Material Requirement Planning (MRP) class virtually and the group of students who attended the same topic class in a traditional classroom.

As a follow up to a similar study conducted in the previous year<sup>[4]</sup>, this paper hypothesized that there is no difference in the effectiveness of learning between a class in a traditional classroom setting and a virtual classroom setting and provide recommendations for enhancing effective teaching in a real-time distant learning environment. These results and recommendations will benefit all faculty in their future planning when designing a distant learning course.

According to the United States Distant Learning Association (USDLA)<sup>10</sup>, distant learning is defined as the acquisition of knowledge and skills through mediated information and instruction, encompassing all technologies and other forms of learning at a distance. The technology that facilitates this quasi-experiment was Adobe Connect. Shortly after the experiment though, Macromedia Breeze was renamed as Adobe Connect Professional. In this paper, it will be addresses as Adobe Connect.

Adobe Connect has been developed in the last few years. Previously, educators used other offline distant methods to deliver the lecture to students such as video, DVD, and video conference. Since the Internet started influencing in every industry, several communication methods through the Internet have been developed online through the Internet such as Web-based blackboard and whiteboard, Web-based conference, and having the PowerPoint presentation on the Website. New software has been developed to enhance the capability of the Internet such as Net Meeting, Centra 6, WebEx, PointCast, MediaSite, and Adobe Connect.

Not only in university level, was Adobe Connect also used in K-12 education. High school in Alamo Heights Independent School District in San Antonio, Texas, has developed and employed the distant learning though Adobe Connect<sup>[5]</sup>. The School District of Palm Beach County in Florida uses Adobe Connect to deliver online communications and training<sup>[6]</sup>.

Adobe Connect has a Meeting Room function that allows a host<sup>1</sup> to e-invite participants for a virtual conference, or attends a lecture as this experiment would use it for. With a set of headphones and microphone, the host can either share the computer screen, document, or an application. There is also an option to start the camera and voice, and then under Meeting, record the meeting. Adobe Connect creates a URL for the student to revisit the lecture at later time.

In education, since web-based and other distance learning techniques convey through the Internet, which is generally a one-way communication, instructors do not get the real-time response from student as in a classroom. This limitation can be eliminated through Adobe Connect. Instructors can teach students via Microsoft PowerPoint presentation with audio and video communication through Adobe Connect. It offers several interactive functions that could increase learning effectiveness. Since it is equipped with audio and video capability, students can see instructor's movement and hear the voice, which is similar to a real classroom. Another benefit for students is that they can watch the lecture at anytime, on any platform that has an internet browser, and they can review lessons regularly.

There are also interactive functions in Adobe Connect that would be helpful in soliciting responses from distance students in a real-time Adobe Connect "classroom." For example, instructors can poll a multiple choice question and student chooses one answer. The answers from the students are available to the instructor real-time anonymously. In this way, the student is more encouraged to participate actively in a real-time Adobe Connect "classroom" than in a

---

<sup>1</sup>The speaker who sets up the virtual meeting room and presents the lesson content. Only the host has the privilege and power to issues poll, grants microphone rights, shares desktop content, illustrates on virtual whiteboard, and invites or restricts participant access to the virtual meeting room.

traditional physical classroom. Another useful function that focuses on interactivity is a chat session. Student can send feedbacks to instructor real-time and contact classmates through a chat session as well. In comparison, a chat session in a real-time Adobe Connect “classroom” is not as disruptive as a chat session in a physical classroom.

From the instructor perspective, Adobe Connect improves course management with a number of teaching tools. When a lesson is recorded, the instructor can upload the script and look at it. If the instructor is not satisfied or wants to add comments to any PowerPoint slide, the instructor can return to the slide and re-record only the slide they want to edit. This script also becomes available to students as the lecture progresses, hence facilitating student’s absorption of the presentation through visual-audio coordination.

## Literature Reviews

Since distant learning is a key role to the education system, several studies have been conducted to see the trend and effectiveness of each distant learning method. There was a study that used the interactive multimedia-based including 3D animation, simulation, video, graphics, and audio<sup>[3]</sup>. The results of this study showed that there was no significant difference in learning between the experimental group and the control group. However, they tested with a small sample size of 20.

Another research was a study of a web-based multimedia whiteboard system to help students learning with mathematical problem solving<sup>[2]</sup>. Sixth grade students used electronic whiteboard to write down their mathematical problem solving solutions and voice recording tool to give oral explanations about their thinking behind the solutions. The results show that students were satisfied with the use of the multimedia whiteboard system for helping them with learning fractional division.

Teacher education students at a mid-Atlantic university took a Web-based and laboratory-based learning environments and test on four different cognitive achievements, consisting of analyze, apply, understand, and remember<sup>[7]</sup>. The result showed that students taking the Web-based course achieved higher scores at remember and understand levels than laboratory-based students did but scores on apply and analyze levels were in the failing range for both groups.

Mediasite is a highly automated, rich media presentation system by Sonic Foundry Inc. that offers the similar capabilities as Adobe Connect<sup>[9]</sup>. It is Instructors can give the presentation or lecture using any video, graphic, or presentation source. They also are able to record and publish the lectures over the server for broadcasting. Students can take a lecture over the Internet. It has been used for academic purposes by some universities such as School of Nursing at West Virginia University<sup>[1]</sup> and York University in Toronto, Canada<sup>[8]</sup>.

## Method

In the previous study, only two post-tests had been conducted to test and evaluate the performance of students in the traditional classroom group and online group. There was no

evidence to prove that students in both groups have the same background. In this study, a pre-test was used to validate the experience level students possess prior to the experimental lecture.

The pre-test consisted of ten questions which were a combination of multiple choices and fill-in-the-blank questions. It assessed both basic concept knowledge and calculation ability. The pre-test was administrated one week before the lecture. Two post-tests were conducted to assess the effect Adobe Connect had on students in the short term and long term. As a short term assessment, the first post-test was completed right after the class. At the end of each lecture, an instructor used the last ten minutes for students to answer the first post-test. As a long term assessment, the second post-test was done in WebCT Vista three days later. Students were asked to login to WebCT Vista and take the assessment within 24 hours of the third day after class.

For uniformity, both post-test 1 and post-test 2 consisted of 10 questions. However, the combination and question style were different than the pre-test questions. Post-test 1 contained the same set of questions as the pre-test, while post-test 2 was composed of a combination of multiple choices and true/false questions. Questions in post-test 2 were more detailed oriented with concept questions, and included less calculation than pre-test and post-test 1.

Besides testing assessment, the survey was also administered one week after a class. All students in both classes were asked to answer the first half of survey to examine students' perception of distance learning. For the second half of survey, students in online groups were asked to rate the importance of factors to the effectiveness of online class through Adobe Connect. They were also asked to rate features in Adobe Connect on how they help students to understand and participate in online lectures. Furthermore, students had an opportunity to comment what they like and dislike in Adobe Connect, and provide suggestions for further online class through Adobe Connect.

### Experiment of Design

This study was tested using an IT 442 class at Purdue University. The class title was Production and Operation Management and offered each Fall semester. The class time was at 1:30-2:20 pm on Monday and Wednesday. Each week, students needed to participate in lab for two hours to learn the related software and practice hand-on exercises either on Tuesday or Thursday. Lab sessions were taught by a teaching assistant. Forty two students were registered for this course. The majority were senior students in Department of Industrial Technology.

Two weeks prior to the experiment, the class was informed about the research conducted by instructor and teaching assistant. Volunteers were solicited to participate in the online lecture group. Motivated by the luxury of attending class from the comfort of own home, eleven members of the class signed up for the online lecture group. They agreed to take the online lecture at 9:30 am on the same day as the traditional class. One week before the experiment, online group students received an instruction on the proper procedure to login to the online class, including how to communicate with instructor, how to use the chat session, and how to answer the poll questions. This instruction (Appendix A.) also included the virtual class interface to help students become familiar with the online class.

The online class was conducted from the Supply Chain Management Technology Laboratory. The teaching assistant of this class was the assigned instructor for both lectures. Only the instructor and his assistant were in the room. The environment of the teaching room was quiet and bright. Three computers were active and controlled simultaneously throughout the lecture so as to maximize effective communication with students. The main computer was used by an instructor to communicate with students. He also used another computer to show the PowerPoint files. The third computer was used by an assistant to monitor a chat session. If students sent any questions regarding the topic, an assistant would inform the instructor. For messages that were not related to the topic, she would answer them herself. This prevented the instructor from being distracted by unnecessary messages. This computer also served for another purpose. An assistant logged in to this computer as a student to make sure the students could see the lecture on their computers as intended. Figure 1 shows the screenshot from the third computer. This screenshot looks the same as the students' computers.

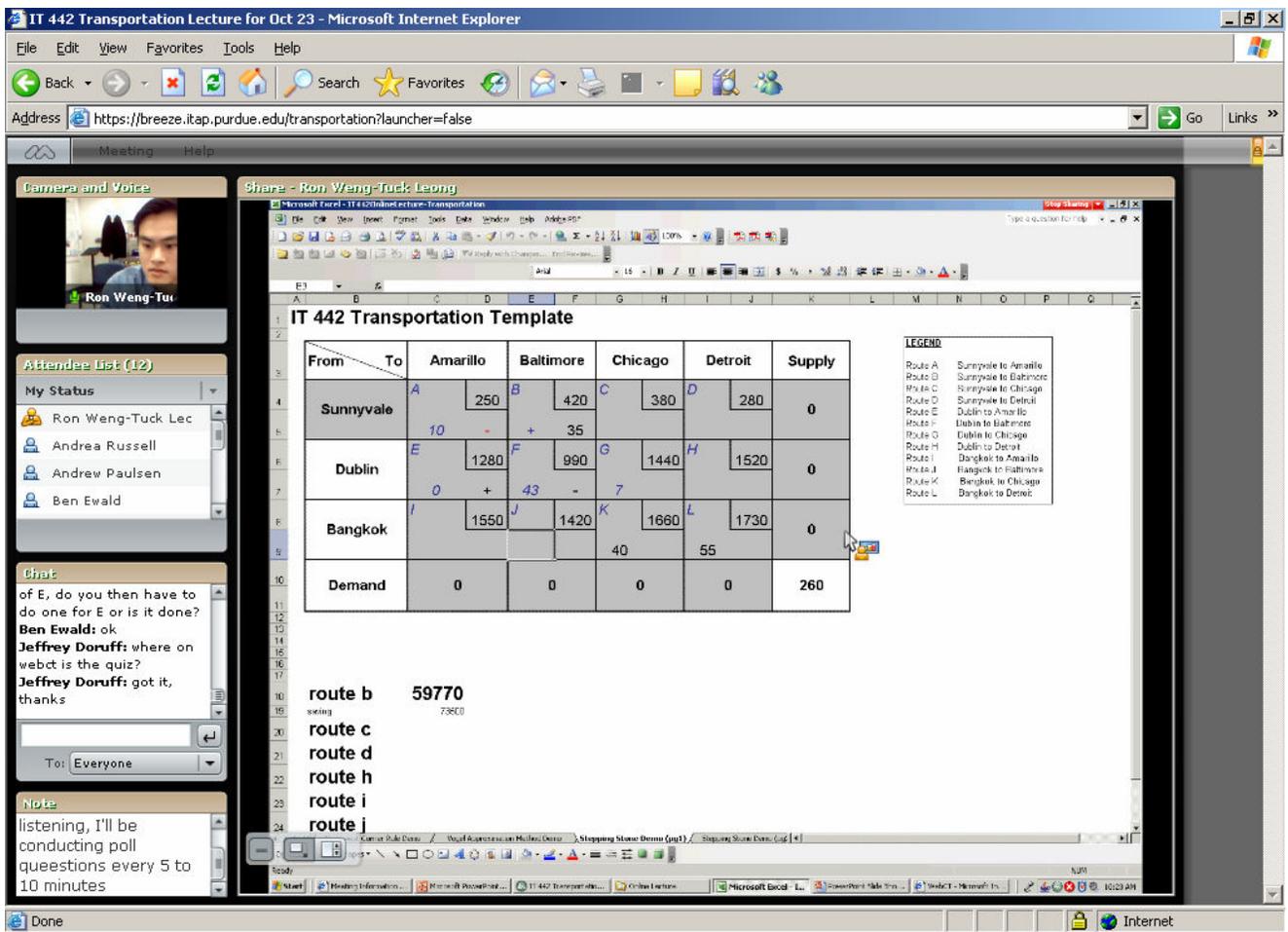


Figure 1. Virtual Class Screenshot

## Hypotheses

Five hypotheses were tested in this study. The first three hypotheses were testing students' knowledge for pre-test, post-test 1 and post-test 2. They tested if students' performance in traditional class group were significantly different from online group, measured by their total score out of ten. The other two hypotheses were testing the improvement from pre-test for post-test 1 and post-test 2, specifically, the score difference between pre-test and each post-test.

Hypotheses 1: Pre-test: The knowledge of students in a traditional class is no different from the online class

Hypotheses 2: Post-test 1: The knowledge of students in a traditional class is no different from the online class

Hypotheses 3: Post-test 2: The knowledge of students in a traditional class is no different from the online class

Hypotheses 4: The improvement of test scores in post-test 1, compared to the pre-test of students in traditional class is no different from the online class

Hypotheses 5: The improvement of test scores in post-test 2, compared to the pre-test of students in traditional class is no different from the online class

## Research Design

Undergraduate students of a Production and Operation Management class were invited to attend one of the regular Monday lecture as part of this quasi-experiment. The class consists of 42 students; 11 students of the class attended the lecture in a virtual setting (test group), 28 students attended the lecture in a traditional classroom (control group), and 3 were absent for work and health reasons.

One week prior to the experimental lecture, students were asked to take a pre-test. Lecture of both groups were structured similarly, and intended to cover as much material. After the 40 minute lecture, students were required to take a 10-question post test. They were asked to complete the second post-test on WebCT Vista three days later.

## *Lecture*

The topic covered in this lecture was transportation. A teaching assistant, an instructor for this class, started with the importance and objective of transportation problems. The transportation table was introduced as the problem solving tool. Three widely used methods were taught in this lecture: the lowest-cost method, the northwest corner rule, and the stepping stone method. The first two methods were meant for initial solution derivation. The stepping stone method, however, was aimed to find an optimal solution, using an initial solution derived throughout one of the first two methods. All three methods were demonstrated using a transportation table.

For the traditional group, the instructor taught the concepts of transportation in a traditional classroom setting using Microsoft PowerPoint on a projector screen. For the online

group, the same PowerPoint presentation was projected through Adobe Connect. After the concept section of the lecture, the instructor switched between Microsoft PowerPoint and Microsoft Excel to demonstrate the rules and regulations in deploying the three transportation methods.

### *Pre-test*

The pre-test was administered in a class one week before the experimental lecture. A teaching assistant supervised the pre-test at the end of a lecture. Students spent the last 10 minutes of class for this test. The pre-test was designed with 10 questions. The first six questions were structured as multiple choices to test the understanding of transportation concepts and the three methods. The next four questions were structured as fill-in-the-blank with the intent to test students if they are able to quantitatively solve a transportation problem using the stepping stone method. Given an initial solution for a transportation problem in a table with specific shipping amount and shipping cost, students were asked to calculate the cost improvement for each alternative route by using the stepping stone method. No partial credit was awarded for these questions. Answers were either awarded one point or no score.

### *Post-Test I*

Post-test 1 was administered 10 minutes before the class dismissed. An instructor spent about 40 minutes for the lecture. Questions in post-test 1 were a replica of the pre-test.

### *Post-Test II*

Post-test 2 was administered using WebCT Vista. This post-test was designed with 10 questions, and organized in the same way as the pre-test and post-test 1. The first eight questions were multiple choices to test their knowledge and concept of transportation problems and three methods. The last two questions were true/false questions. There was no calculation for this post-test. There was no partial credit for these questions. The answers were either awarded one point or no score.

### Result

After pre-test, post-test 1 and post-test 2 were completed, all questions were graded and scores were collected. The total score for each test was ten points. The total number of students in this class was 42: 11 students participated in the online class at 9:30 a.m., and 31 students participated in a regular classroom at 1:30 p.m. Since all three tests were not mandatory, not every participant completed the test. Also pre-test and post-test 1 were completed in class and post-test 2 was completed on WebCT Vista, therefore some students may have completed one test but not the other.

The number of students who attended the traditional class group and

- Completed the pre-test: 28
- Completed the post-test 1: 26
- Completed the pre-test 2: 28

The number of students who attended the online virtual class group and

- Completed the pre-test: 11
- Completed the post-test 1: 10
- Completed the pre-test 2: 11

The average score of each test for both groups, and the average score of improvement from each post-test from pre-test were shown in Table 1. Improvement refers to the difference of score between the pre-test and each post-test.

	<b>Class Group</b>	<b>Online Group</b>
Pre-test	2.93	3.36
Post-test 1	4.96	3.60
Post-test 2	6.75	6.00
Improvement 1	2.21	0.20
Improvement 2	3.80	2.64

Table 1: Test score tabulation

For the pre-test, the average score of the traditional and the online class were 2.93 and 3.36 respectively. It appeared that students in the online class did better on the pre-test. However, the score on the pre-test does not prove that they have a higher level of knowledge than the other group.

In post-test 1, the score between the traditional and online class groups were 4.96 and 3.60 respectively. The difference of both groups is 1.36. It appeared that students in traditional group performed much better than the online group. In post-test 2, the difference narrowed from 6.75 to 6.00. This seemed large enough to indicate a difference. A statistical analysis was needed to test the difference.

This study was conducted as a quasi-experimental design the five percent significant level. All hypotheses were tested at  $\alpha=0.05$ . If the p-value of hypotheses is less than 0.05, the decision for that hypothesis is that there is significant difference in average score. On the other hand, if the p-value of hypotheses is greater than 0.05, then no significant difference in the average score between the test group and the control group can be concluded.

All tests were performed using Microsoft Excel. They were tested using ANOVA: Single Factor command in Data Analysis function. The purpose of this test was to examine if there was a significant difference between the two groups with one factor. The results for all hypothesis tests are summarized in Table 2.

	<b>F</b>	<b>P-Value</b>	<b>Significant?</b>
Pre-test	1.7069	0.1994	No
Post-test 1	5.0940	0.0305	Yes
Post-test 2	1.2153	0.2774	No
Improvement 1	9.7380	0.0038	Yes
Improvement 2	2.1636	0.1505	No

Table 2: Tabulation of hypothesis tests

## Survey

In addition to the post tests, this study included a short survey. This survey was administered after students had taken the transportation class. This survey was organized with three major sections: (1) demographic and background, (2) experiences with distance learning, and (3) virtual class experience with Adobe Connect. Survey form is shown in Appendix B. All students were asked to answer the first two sections, and only students who participated in the online group answered all three sections. The number of students who completed the survey differs from the number of students who completed the post-tests, due to the fact that some students failed to complete post-test 1, post-test 2 or both. Also, the number of students' responses to each question varied because some students could not answer some questions. Below are some results from survey by major areas

### *Demographic and Background*

- The majority of students were in the industrial technology program, 26 out of total 36. Nine were in dual Industrial Technology/Industrial Distribution (IT/ID), and one was from another major.
- All students in this class are the upper class. Thirty students were senior and six were in juniors.
- The majority of students were male. There are 32 males and 4 females in this class.
- Eight students were taking 4 courses, while 28 students were taking 5 and 6 courses in this semester.
- The number of hours that students spent on school work was evenly distributed. Two students spent less than 5 hours per week, while 2 students spent more than 20 hours per week. However, the majority spent 5-10 hours per week.

### *Experiences on Distance Learning*

- Most of students (27 out of 35) have never taken a distance class at Purdue University before.
- The distance learning method they experienced most was through the internet. Some of them did self-learning.
- The student's perception through the online class compared to the traditional class was distributed. One student thought that the online class was much better, while another student said it was more inferior to the traditional class. However, most of them (9 out of 14) said the online class was a bit poorer.
- If students can choose to learn between distance learning and traditional lecture, most students (29 out of 34) prefer to study in the traditional classroom. Five students preferred the distance class.

### *Adobe Connect Experience from an online class*

- This section of survey was referred by only students who took the Adobe Connect class. They provided some comments on learning through Adobe Connect
- Students thought that quality of the instructor is the most important factor that effects learning through Adobe Connect. The average score was 4.36 out of 5. Audio quality, the environment of the place, and video quality were the next important factors. The

connection of speed of the Internet had the least effect. However, its average score is still high, which is 3.45 out of 5.

- However, most students think the instructor has only a medium impact to Adobe Connect's effectiveness
- Students rate 3.00 out of 5 for the ability to attract instructor's attention when they need it. No one rate very ineffective and effective
- Students rate 3.09 out of 5 for the effectiveness of the poll questions to keep student's attention. Though threes students rated it was very effective, another student said it was very ineffective
- When asking students how features in Adobe Connect help them to understand and participate in lecture, they rated the ability to see several types of files and be able to switch back and forth is the most helpful, followed by the ability to response the questions from instructor (3.00), while the ability to communicate with instructor real-time was rated the least helpful (2.91).
- The property that Adobe Connect has the same capacity as in the traditional class room are
  - Ability to receive lecture content, concept, and other information
  - Ability to see PowerPoint presentation and other software
  - Ability to see and hear an instructor
  - Ability to get information
  - Ability to interact through chat window
  - Ability to communicate with instructor real-time
- Things that students like in Adobe Connect
  - Ability to access from home or anywhere
  - Ability to access anytime
  - Having computer right in front of them
  - Don't have to talk in class
  - Don't need to be in class
  - Convenience
  - Sit in a comfortable chair
  - Can get other things done at the same time
  - Preferable environment
- Things that students dislike in Adobe Connect
  - No microphone
  - Easy to distract
  - Hard to ask questions
  - Harder to understand concept
  - Communication is not as good as a traditional class
  - Lost concept due to technical problems
  - Internet connection
  - Hard for instructor to keep up with the questions and comments in real-time
  - Cannot interact well
  - Cannot see other students
  - Possibility of computer problems that causes them miss a lecture
  - Slow response to questions
- Things that students want to see more in Adobe Connect

- More interaction
- Better atmosphere

## Discussion

An instructor and his assistant had prepared for the online class one week ahead. They ran the pilot tests on the Adobe Connect and recorded the meeting. Nevertheless there were several problems occurring during the online lecture. First, due to technical difficulty, some students' microphones could not be enabled. If they wanted to comment or ask a question, they had to type in chat windows instead, which took a longer time than speaking through microphone. Hence discussion could not be effectively facilitated. However, multiple choice questions were distributed every ten minutes to ensure students were still attentive.

According to the plan, there should have been a record of the class lecture provided to students if they wanted to repeat the lecture in the future. However, the instructor and his assistant realized that they did not record a lecture when there was 15 minutes left in class. Therefore, there was no recording for students to take the repeat class later as they should be able to.

The lesson content was not presented in a desirable pace due to the initial learning curve with various functionalities in the virtual meeting room. As a result, the second half of the lecture, which constitutes 40% of the post test grade, was breezed through very quickly with little time for students to clarify their doubts.

From the statistical analysis, students in the traditional class performed in post-test 1 significantly better than students in online class. However, it may not be the effect from different learning methods. Due to some unprepared and mistake that occurred during the online class, an instructor was unable to teach as well as in the traditional class.

For post-test 2, there was no strong evidence to prove that students in traditional class were better than students in online class. Score of post-test 2 is a lot higher than post-test 1. Some possible explanations are

- Students had another class on Wednesday before post-test 2 was conducted. They had a chance to study one more time
- Students were able to read a textbook before taking post-test 2
- Different set of questions. Post-test 1 had 6 questions that needed calculations, while post-test 2 had only 1 question. Students may have needed more practice in order to do the calculation questions.

The improvement for post-test 1 compared to pre-test was significantly different. Students in the traditional class had greatly improved compared to students in the online class. Nonetheless, it was not significantly different for post-test 2.

Compared to the results from the previous study, students were less impressed with online learning through Adobe Connect. The reason may be because in the previous study, students

took a pre-recorded lecture, which was well prepared by an instructor. The lecture was recorded several times until an instructor was satisfied. Therefore, it was very organized. On the other hand, students took a live class in this study. There were several mistakes, which did not follow the original plan.

## Recommendations

It was through this experiment that we discovered it is practically impossible to conduct an online class without a pair of side-by-side monitors. The reason is because the host is not able to detect incoming messages when he is sharing his desktop applications or PowerPoint slideshow.

This problem can be resolved if each and every participating student has a microphone, and that each and every student's microphone privilege is enabled by the host. The drawback might be unwanted disturbance from students, and unintended background noises transmitted from student's microphone.

## Future Research

Class size is a bigger factor that affects student's learning in traditional classroom than in virtual classroom. While it is a well established rule-of-thumb that bigger class size correlates to less effective student learning because less personal attention can be devoted to individual student, virtual class room may not suffer from this rule-of-thumb. Future research may focus on the effect of student learning in varying virtual class sizes.

After Macromedia was acquired by Adobe, Macromedia Breeze incidentally became a part of Adobe Acrobat family, rebranded as Adobe Acrobat Connect. This make-over included an enhancement upgrade on its Voice over IP (VoIP) and presenter audio quality. Participants of this and a previous experiment were critical about Breeze's VoIP and presenter audio quality. Hence a subsequent experiment may include comparison of participant's rating of Adobe Connect's VoIP and presenter audio quality.

## Conclusion

Converting a traditional production and operation course to an online course offering where students are actively involved in the learning process takes time and effort. Instructors are challenged to provide students with a learning environment that stimulate learning in all dimensions. One way to meet this challenge is to create media-rich online teaching modules. These modules help to create a learning environment that is student-centered where students are actively involved in the learning process.

The intent of this paper is two fold. First, it attempts to promote Adobe Connect as an effective candidate for distance learning. In this study, students who had a direct experience provided some advantages and disadvantages of Adobe Connect, along with their suggestions and comments. Second, it attempts to alert the instructors who plan to teach an online course to be aware of the possible problems that may occurred.

Although there were a significant difference between students in the traditional class and online class, it does not mean that online lecture through Adobe Connect is inferior to the traditional class. Instructors need to be well prepared not only on the lecture itself, but technology, including hardware and software, should be operate properly also. When all requirements and conditions are met, the online course will provide the results as good as the traditional class.

## References

1. DiMaria R. N. (2004). West Virginia University School of Nursing Makes the Move to Web-Based Learning. *T.H.E Journal* 31(7), 42-44.
2. Hwang W., Chen N., and Hsu R. (2006). Development and Evaluation of Multimedia Whiteboard System for Improving Mathematical Problem Solving. *Computers and Education* 46(2), 105-121.
3. Javidi G. and Sheybani E. Teaching an Online Technology Course Through Interactive Multimedia. Proceedings of the American Society for Engineering Education, Salt Lake City, UT. (2004).
4. Khiewnavawongsa, S., Leong, R., and Schmidt, E. Learning a Web-Based Course through Macromedia Breeze. Proceedings of the American Society for Engineering Education, Chicago, IL. (2006).
5. Martinez R. (2004). Internet-Based Training Empowers Alamo Heights ISD Teachers to Increase Technology Use. *T.H.E Journal* 31(9), 41-42.
6. Miller M. (2006) Staying Connected Is A “Breeze” . *T.H.E Journal* 33(10), 18-20.
7. Overbaugh R. C. and Lin S. Y. (2006) Student Characteristics, Sense of Community, and Cognitive Achievement in Web-based and Lab-based Learning Environments. *Journal of Research on Technology in Education*, 39(2), 205-223.
8. Parke K. (2002). New Tech App Minimizes Faculty’s E-Learning Burden. *Distance Education Report* 6(12), 4.
9. Sonic Foundry, Inc. Retrieved March 2, 2007, from: <http://www.mediasite.com>
10. The United States Distant Learning Association. Retrieved January 14, 2007, from: <http://www.usdla.org/>

## Appendix A. Instruction to log in a virtual class and interface

### Online Lecture Instruction for IT 442, October 23, 9:30-10:20AM.

#### Things to bring

1. Computer with earphone or speakers
2. Transportation template (You can print it from WebCT)
3. Microphone (so you can communicate with instructor)

#### What to do

1. Wake up and be prepared for class before 9AM.
2. Connect to the Internet
3. Go to the virtual classroom thru the URL below before 9:25AM.

Name: **IT 442 Transportation Lecture for Oct 23**  
Invited By: **Ron Leong (wleong@purdue.edu)**  
Where: **https://breeze.itap.purdue.edu/transportation/**  
When: **10/23/2006 9:00 AM - 10:30 AM**  
Time Zone: **(GMT-05:00) Eastern Time (US and Canada)**

4. You will see this page, you can login as a guest by click "click to enter" (number 1)
5. Enter your name so that the instructor can identify you
6. It'll lead you to the virtual classroom page, as shown below

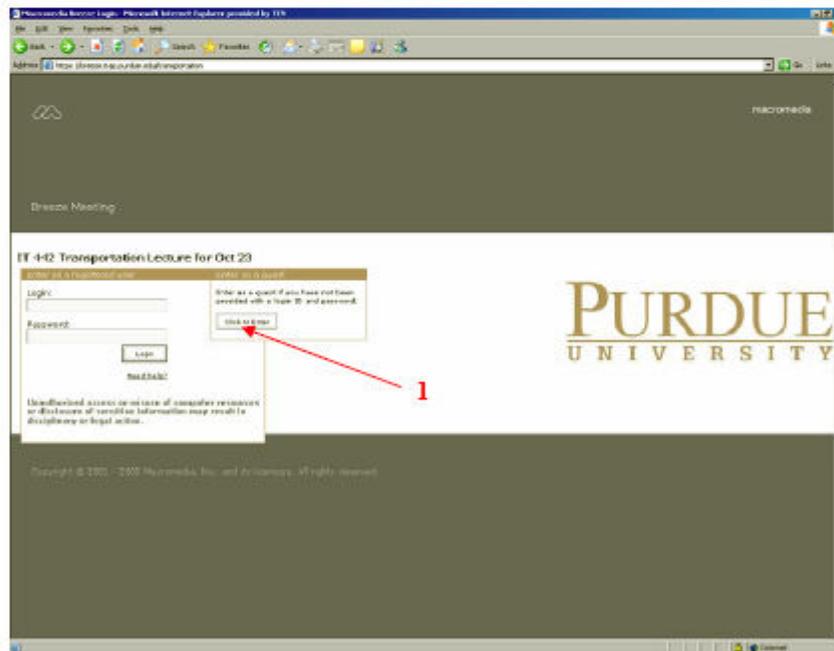


Figure 1. Login page

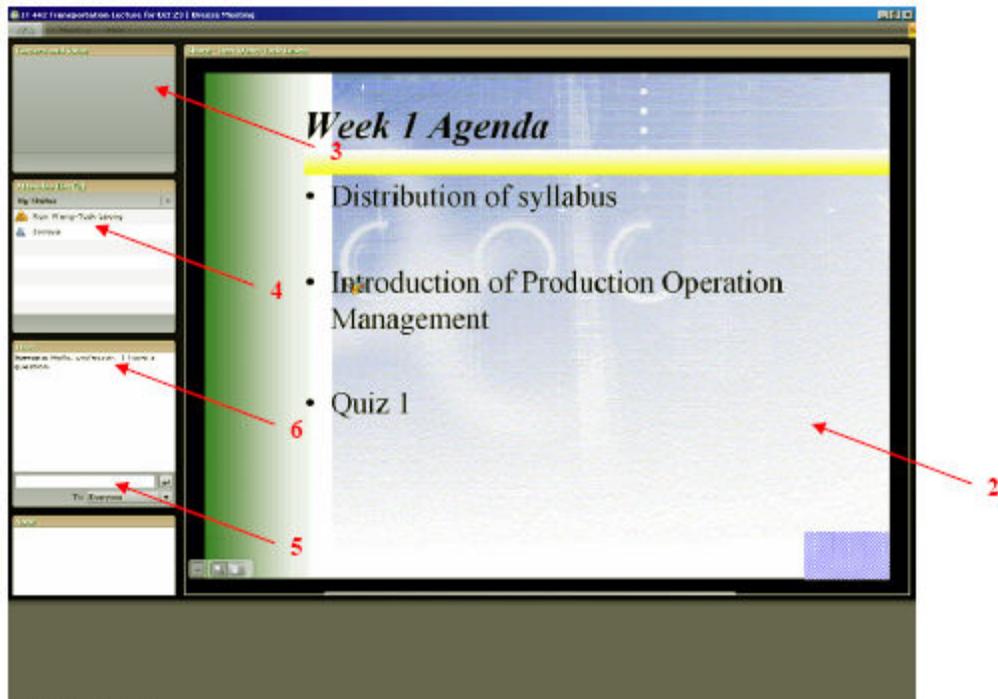


Figure 2. Virtual class interface

**Virtual class interface**

Number 2 – PowerPoint, Excel template, or Virtual whiteboard

Number 3 – Instructor’s virtual presence

Number 4 – Attendee’s list

**How to virtual communicate with instructor**

1. By chat session
  - a. Enter your message/question in the textbox (number 5)
  - b. Your message will be shown in the chat window (number 6)
2. By microphone – just speak into your microphone. Please alert the instructor in chat window before you speak.

### How to answer the questions from instructor

1. Click your answer (number 7)
2. The class cumulative responses and percentage will be shown at number 8

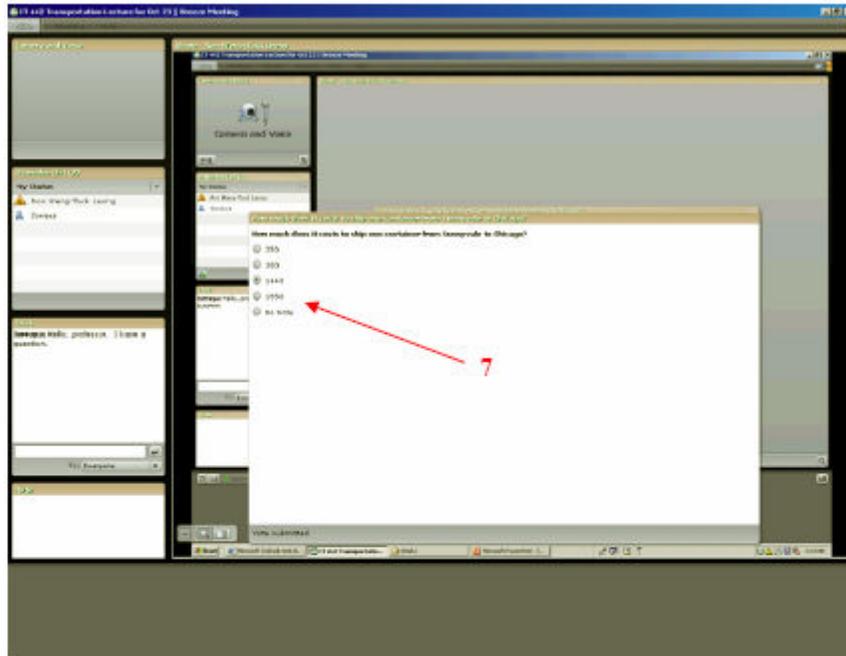


Figure 3. Virtual question window

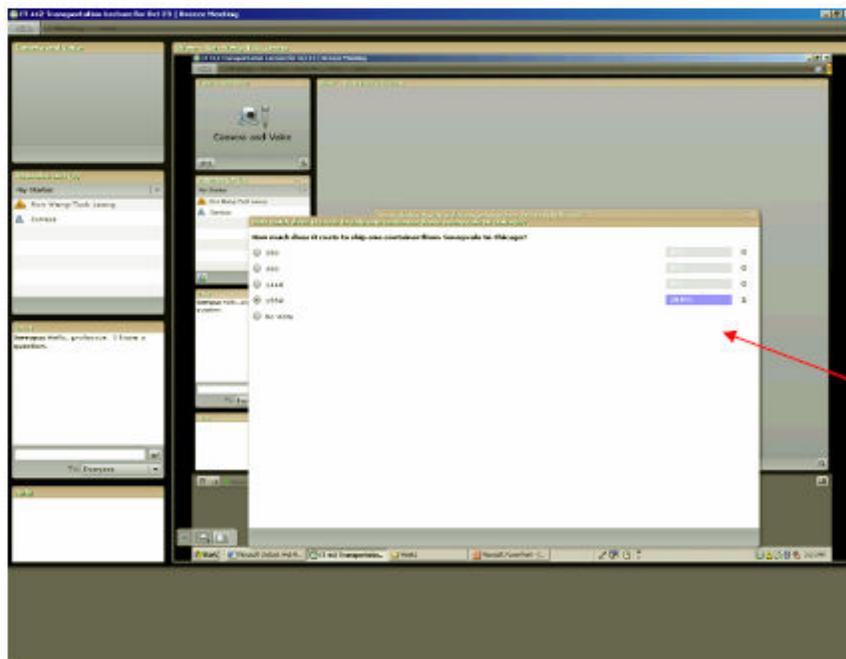


Figure 4. Statistics for class' response

## Appendix B. Survey Form

### Survey

#### Demographic and Background Questions

1. What program are you in? IT / ID / Dual on IT-ID / Others
2. What year are you in school? Freshmen / Sophomore / Junior / Senior Others
3. What's your gender? Male / Female
4. How many courses (on campus) are you taking this semester? \_\_\_\_\_
5. How many hours do you spend on school works such as homework, projects out of the classroom per week? \_\_\_\_\_

#### Experiences on Distance Learning

6. Have you ever taken any distance class at Purdue University? If yes, go to question 7. If no, go to question 9.
  - a. Yes
  - b. No
7. What distance learning did you experience in the past? (Can choose more than 1 answer)
  - a. Internet
  - b. Video/CD/DVD
  - c. Self-learning
  - d. Others, specify \_\_\_\_\_
8. How do you feel about the online class compared to the traditional class?
  - a. Much better
  - b. A bit better
  - c. Same
  - d. A bit worse
  - e. Much worse
9. If you have a chance to choose a class (same class that taught by the same instructor) between a traditional lecture and online lecture, what do you choose and why.
  - a. Traditional lecture
  - b. Online lecture

Reason: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

#### Breeze Experience from Virtual Class

10. Please rate the importance of the following quality that effects to the online lecture through Breeze (5 is highest, 1 is lowest)
  - a. Video (Quality of picture) Rate \_\_\_\_\_
  - b. Audio (Availability and Quality of sound) Rate \_\_\_\_\_
  - c. Instructor Rate \_\_\_\_\_
  - d. Connection speed of Internet Rate \_\_\_\_\_
  - e. Environment of the place you're learning Rate \_\_\_\_\_
11. What do you think about the impact of instructor to Breeze's effectiveness
  - a. Very high
  - b. High
  - c. Medium
  - d. Low
  - e. Very low

For question 12-14, please rate the following questions on a scale 1-5 (1 is very ineffective and 5 is very effective)

12. How able were you to attract instructor's attention when you needed it?

1  2  3  4  5

13. How effective do you think the poll questions were at keeping student's attention?

1  2  3  4  5

For question 14-16, please rate the following Breeze features how it helps you understand and participate in lecture on a scale 1-5 (1 is least help and 5 is most help)

14. Ability to see several types of file and be able to switch back and forth (ex. PowerPoint, Excel, etc.)

1  2  3  4  5

15. Ability to communicate with instructor real-time (Chat window and microphone)

1  2  3  4  5

16. Ability to response the questions from instructor (Poll questions with statistics)

1  2  3  4  5

17. What property that Breeze has the same capacity as in the traditional classroom?

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_

18. What do you like most in Breeze?

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_

19. What do you dislike most in Breeze?

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_

20. What do you want to see more in Breeze?

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_