A comparison of sudent performance using two different on-line lecture delivery softwares

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Abstract

This paper highlights the results of utilizing two different lecture delivery methods in a distance-education graduate class, ENVM641 Environmental Auditing, at University of Maryland University College. The author compares students' performance, as measured by final class grade, between sections taught using different software for lecture delivery, and students' ranking of instructor performance between the two sections.

The university requires the class to be delivered on WebTycho software. Lectures are often provided through the use of written notes transcribed into MS Word documents. Although its asynchronous format is convenient to the students, the design of this delivery method only appeals to students who learn by reading, or visual leaners. In addition, it may not create the greatest sense of connection with the instructor, as students complete the course without ever hearing their instructor's voice.

The instructor wanted to determine if a Power Point presentation with embedded audio would result in increased learning due to the capture of more senses (auditory as well as visual), or possibly create a greater affinity for the instructor due to having heard her voice.

For two successive semesters, two separate sections of the class were taught. In one section, lectures were delivered as notes in MS Word. In the second section (of the same semester) lectures were delivered through Power Point presentations with embedded audio files.

Introduction

It is suspected that lecture delivery methods which incorporate more media would appeal to more types of learners. There are three basic types of learners:

1. Visual, or those who think and learn in pictures

2. Auditory, or those who learn by hearing

3. Kinetic/Tactile, or those who learn by moving, touching, and doing

Hypermedia technology has been shown to have the potential to accommodate learners with different needs through its rich environment[1], suggesting that when more senses are used by a digital media, a greater variety of learners can be accommodated. By designing lectures which incorporate more senses, it may be possible to relate to a larger percentage of the class via their

learning style. Distance education offers a particular challenge for engaging learners over the internet. Nevertheless, students are increasingly seeking education on-line.

In today's competitive work environment, bachelor's degrees have become common place. Workers are seeking advanced degrees as a means of differentiating themselves from their peers within the work force. Additionally, those in the work force without a bachelor's do not always have the ability to quit work and attend school full-time. As a result, on-line degree programs are on the rise, as universities increasingly recognize the benefits of e-learning environments. The benefits to students have been noted to be:

- *The opportunity to take courses without having to physically travel to the instructor's location.*
- *The ability to take courses in one's area of interest.*
- *The capability to complete a customized degree using credits from several universities[2].*

Evidence indicates that the convenience of on-line learning is most likely major driving force behind those choosing this method of education. A 2009 study surveyed the students at the UNC Charlotte College of Engineering to determine their perceptions of on-line learning and delivery methods (asynchronous on-line, blended, and synchronous on-line).[3] Female students tended to express more interest in on-line learning, especially in the asynchronous and blended formats. The gender difference was greater among graduate students than undergrads, with female graduate students expressing the most interest in on-line learning. The authors of this study suggest that female graduate students choose learning formats with the greatest flexibility because they are trying to balance family and professional life. This study also found that the age group found to be most interested in on-line learning is 36-45, and that part-time students have a higher preference for on-line learning. It seems that on-line learning appeals more to non-traditional students already in the work force. The study also indicated a preference for asynchronous methods, especially among those who had already taken on-line classes.

Another 2007 study of a hybrid course using a synchronous format indicated that non-traditional students may find on-line learning more acceptable, but also indicated that student's perception of the use of on-line methods mattered in their acceptance of the method.[4] When students perceived the use of on-line lectures as a convenience to them, not the instructor, their motivation and the effectiveness of the method increased. Asynchronous recorded lectures are often preferred by students for their convenience. In one study examining the use of e-learning in a hybrid course, "the ability to download lectures and watch them again was referred to as the most positive aspect of the new delivery system."[2]

Not only does students' perception of the convenience of on-line learning affect its success and acceptance, but research has documented a connection between perceived "teaching presence" and student's sense of on-line learning community.[5] Thus, when considering on-line lecture delivery methods, instructors must strike a balance between the students' need for convenience

(as provided in asynchronous delivery) and their need for a sense of instructor presence. Providing voice recordings with lecture slides may be one way of making students feel more connected to instructors in asynchronous classes.

A 2007 study surveyed over 4,500 students at educational institutions across the United States to determine how students viewed the effectiveness of various technologies used in on-line learning.[6] Again, students perceived asynchronous lectures a more effective for their learning than synchronous lectures. Slide presentations (such as power point) were viewed as more effective than video lectures, which were viewed as more effective than audio recordings of lectures. However, no mention was made in this study of Power Point slides with embedded audio.

Course Structure

The standard practice in ENVM641(Environmental Compliance Auditing) had been to provide written lectures via text. As the literature indicates, students' preference for on-line lecture delivery method is based on convenience. Another important factor is the perceived classroom presence of the instructor. In addition, lecture methods which incorporate more sense may appeal to a greater diversity of learning styles. For these reasons, the instructor wanted to examine whether lecture slides with an accompanying audio lecture (Power Point with embedded audio) would result in increased learning for the students.

For two successive semesters, two separate sections of the class were taught. In one section, lectures were delivered as notes in MS Word. The written notes generally summarized the text and highlighted main points. In addition, the author added important points and perspective from experience the professional practice. In the second section (of the same semester) lectures were delivered through Power Point presentations with embedded audio files. These lectures also summarized the text and highlighted main points. More examples from professional practice occurred in the Power Pont lectures, along with greater details, The Power Point lectures could be considered richer in extra examples beyond the text. In both sections, a group research project was assigned capture the interest of the kinetic/tactile learners. Students were not made aware of the different format of the sections.

Student Grade and Instructor Ranking Results

A total of 78 students took the class over the two semesters. Summative assessments (graded evaluations) were used to compare student teaching Students overall class grades were examined to see if the different lecture delivery resulted in a measurable difference in learning. Class grades were composed of 10% discussion participation, 10% project participation, 25% group project, 15% each for three quizzes, and 5% each for two individual exercises.

- Discussion participation: A discussion topic was posted each of 10 weeks of class. The students were required to post one meaningful response to the topic and a minimum of

one response to another student's post. Students were advised to ask each other open-ended questions, with a focus on dialogue.

- Project participation: The students worked on projects in teams of 4-5. At the end of the semester, they each rated themselves and their peers on their participation in the project. Each student's grades were averaged. The average was used as their participation grade.
- Group project: The students worked on projects in teams of 4-5 through the semester and provided a group report at the end of the semester.
- Quizzes: Three were assigned throughout the semester to assess individual student learning. Quizzes were provided on a Monday, and students were given one calendar week to work on them. Resources were available to the students for use, such as the text, lectures and notes, and the results from any other research the student cared to perform. Students were instructed not to discuss the quizzes among themselves.
- Two individual exercises were also assigned to reinforce course concepts, although exercise one was a review of material from previous courses. Exercises were provided on a Monday, and students were given one calendar week to work on them. Resources were available to the students for use, such as the text, lectures and notes, and the results from any other research the student cared to perform. Students were instructed not to discuss the exercises among themselves.

The final class grade was compared, as well as grades for quizzes and exercise to determine any differences in student learning and final class performance between the two lecture methods. No other assessment of student learning was compared. The students' overall ranking of the instructor was also compared to see if the difference in lecture delivery method affected the students' opinion of the instructor. Means and standard deviations for both lecture delivery methods are presented in Table 1. T-tests were performed to determine if the differences in the means was statistically significant.

The quizzes assessed student learning of class materials. Quiz one covered the policies, risks, and motivations behind environmental compliance audits. Quiz one displayed a 2.99 percentage point difference between the mean grades of the two sections. The higher grades were achieved by students with the Power Point/audio lectures. The difference was statistically significant, dictating that for the first quiz, lecture delivery method mattered. Quiz two assessed students' knowledge of procedures and ethics for performing compliance audits. The second quiz results displayed a very small difference in mean grades, with the section receiving audio lectures only 0.18 percentage points higher. This difference was not statistically significant. Quiz three assessed students' comprehension of a Phase I environmental investigation report. For quiz three, the mean grades of the section with Power Point/audio lectures was 2.04 percentage points higher, but this difference was also not statistically significant. Overall, the students in the section with Power Point/audio lectures performed better on quizzes than their peers receiving written lecture notes. However, only on one out of three quizzes was this difference statistically significant.

Exercise one reviewed the major federal environmental regulations, covered in a prerequisite class. For exercise one, the mean grades of the section with Power Point/audio lectures was 2.09 percentage points higher, but this difference was not statistically significant. Exercise two addressed the major elements of environmental audit programs, the theme of the course. Exercise two was the only grade element in which the mean grades of students in the section with Power Point/audio lectures performed worse, a 1.10 percentage point decrease. This difference also was not statistically significant. The exercise one materials were presented in prerequisite classes. As the lecture materials (in either format) did not cover the materials in the exercise one, the results from this exercise could be considered a control. In fact, they exhibited the same general trend of slight increase in grade with a Power Point/audio lecture, though not statistically significant. For exercise two, which summarized major points from the course materials, students actually performed slightly worse with the Power Point/audio lecture, though also not statistically significant. One reason for this difference may be that written notes allowed easier review or "look up" of the answers for the students than an audio presentation. But since these concepts were also covered in the text, which is easily skimmed, no other explanation can be provided than natural background variation in grades between semesters.

Students' mean grades exhibited approximately one percentage point increase in their grades when lectures were delivered as Power Point slides with embedded audio, as opposed to written text in MS word. However, this difference was not statistically significant. The mean overall instructor ranking increased 0.11 (on a scale of 1 to 5) with the use of Power Point slides with embedded audio, which also was not a statistically significant difference.

Table 1. Statistical Comparison of the Lecture Delivery Methods

	MS Word (Mean + SD)	Slides + Audio (Mean + SD)	Difference	p-value
Number	40	38		
Quiz 1	89.86 + 1.37	92.85 + 1.22	2.99	0.046
Quiz 2	99.31 + 0.406	99.49 + 0.334	0.18	0.659*
Quiz 3	91.94 + 2.85	93.98 + 1.04	2.04	0.370*
Exercise 1	96.82 + 1.39	98.91 + 0.639	2.09	0.099*
Exercise 2	96.97 + 0.896	95.87 + 1.01	-1.10	0.321*
Final Grade (0-100)	88.06 + 2.34	89.15 + 1.93	1.09	0.941*
Instructor Overall Rating (1-5)	4.25 + 0.175	4.36 + 0.14	0.11	0.084*

*Difference is not statistically significant.

Conclusions

The standard method of delivering lectures on ENVM 641 was through written text in MS word files. It was anticipated that Power Point slides with embedded audio would lead to increased

student learning due to the use of more senses, as well an increased instructor ranking due to a higher sense of connection with the instructor. Overall, the students in the section with Power Point/audio lectures performed better on quizzes than their peers receiving written lecture notes. However, only on one out of three quizzes was this difference statistically significant. Exercise one exhibited a small increase in mean performance with Power Point/audio lectures, and may be considered to serve as a control, as the materials covered in this exercise were not presented in the lectures, but in previous courses. Exercise two indicated a small decrease in mean performance f or students receiving Power Point/audio lectures, which may be due to natural variation between section student grades form section to section. There was a very slight increase in mean student class grade as well as overall instructor ranking, but neither of these differences were statistically significant. These results indicate that students may perform slightly better and have a slightly greater ranking of instructors in on-line classes which utilize slide lectures with audio, but the differences could not be statistically proven.

It is possible that the lecture delivery method made very little difference in student performance because of the open-resource nature of the on-line quizzes and assignments. For both quizzes and exercises, students had a full week to complete each with open notes/lecture/resources. They were only asked not to discuss the quizzes and exercises amongst themselves. Thus, students who had not committed class concepts to memory still had the ability to look them up. Further work could utilize proctored, time-limited exams to better ascertain differences in learning.

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