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USING AUDIO-VISUAL TECHNOLOGY IN ONLINE TEACHING: A STUDY OF STUDENTS' REACTIONS

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This study surveyed students who had taken an online managerial finance classes to measure the effectiveness and impact of audio-visual technologies on anxiety levels, preferred learning styles, satisfaction, and ease in mastering course material. Results showed that a learning style that favors both audio and visual teaching methods existed. Using audio-visual pedagogical techniques helped reduce students' anxiety levels and created a more personal atmosphere for the online class. The benefit of a more personal environment significantly correlated with both mastering the material and understanding complex processes involved in finance. In addition, the authors speculate on the potential connection between reduced anxiety levels and a higher level of student satisfaction for the course. The authors found no major gender differences related to anxiety levels prior to taking the course, and further that the anxiety level was not related to the fact that course was offered online.

INTRODUCTION

The online teaching and learning environment has become an attractive option for delivering instruction. Projections for the year 2007 indicated that nearly 50 percent of all higher education learners would take some classes via the Internet (Tesone et al., 2003). Both traditional and non-traditional students can potentially benefit from online learning, but the format is particularly relevant to non-traditional students. The inherent benefits of online learning appeal to non-traditional students, who are usually 24 years and older, employed full time, and unable to take classes during the daytime. By engaging in online classes, non-traditional students can increase their knowledge and skills without giving up their job, leaving home, or losing income (Tesone and Ricci, 2003). Karelis (1999) noted that online courses present significant opportunities for postsecondary education; offer lower than average per-student costs; and deliver pedagogically-sound and even individually-tailored instruction. One of the major benefits of online instruction is the ability to reach students by removing time and space barriers. Little is known, however, about how to increase student comfort levels and learning while reducing anxiety and using new audio-visual programs within an online context. The present study, therefore, investigates whether students who are exposed to material via robust audio-visual presentations exhibit different experiences that may contribute to a more effective learning environment.

Studying this situation requires an understanding of the beliefs and perceptions of both instructors and students regarding online courses. This understanding may help educational institutions devise mechanisms to use this emerging environment efficiently to deliver instruction. Although some attempts to determine attitudes and concerns toward online courses have been made (Wilson, 2001; Gerlich & Wilson, 2004), the literature is still unclear whether the use of newer, user-friendly technology improves students' reception to online classes.

Every instructor is a content expert who can select, organize, and annotate content for student study. Organized course content is typically expressed as text in a printed or digital format (Graves, 2004). Text alone, however, can restrict the presentation of material. In particular, text is a very limited way to present quantitative material, such as that found in a managerial finance course. If the student could be engaged by providing creative ways to view steps of calculations, synthesize processes, and see relationships among variables, this may enhance the learning experience. Further, if students had the ability to review processes at their leisure to reinforce concepts taught, this method may lead to a more satisfying online experience.

THE ONLINE ENVIRONMENT

Understanding how to teach online entails more than just learning new technology. It also involves in-depth knowledge of how students respond to and learn in online settings. In essence, it requires instructors to become a student in the realm of educational technology; to become learners in relatively uncharted learning environments. As instructors, we alternately teach others and allow them to teach us. Every encounter with online teaching and learning thus becomes an informational interview or experiential research project with online media, the course content, our own pedagogies, the students themselves, and their learning processes. Several researchers (Dabbagh & Bannan-Ritland, 2004; Qram, 2006; Palloff & Pratt, 2005), suggest that a gap exists regarding the issue of training and professional development for instructors who will be teaching online. In an online learning environment, the difference in time and space between the instructor and students complicates the instructor's efforts to ensure that students master the more quantitative skills (Wang, 2006).

Some people learn actively and interactively; others focus on facts; some prefer visual forms of information; and some learn from written and spoken explanations (Felder, 1996). Any course of study, therefore, will include students

with various learning styles, backgrounds, and levels of preparedness (Kramer-Koehler, Tooney, & Beke, 1995). These factors influence the students' engagements with learning environments (Sheard & Lynch, 2003). To maximize students' learning experiences, therefore, instructors need to be sensitive to diverse learning styles, needs, and expectations, as well as understand the online learning environment (Mupinga, 2006).

Understanding teaching and learning styles is essential when considering how to deliver instruction online. Online technology that encourages and produces student-directed pedagogical approaches – where students are allowed to suggest alternatives to meet course objectives – is generally a preferred strategy (Williams, 2001). Other researchers have suggested that online courses must be learner-centered, and students must actively participate in order to reap the benefits of online courses (Munro & Rice-Munro, 2004).

According to Miller (2000), learning can be classified into four styles: 1) visual/verbal (learning is best when information is presented both visually and in a written format); 2) visual/nonverbal (learning is best when information is presented both visually and in a picture or design format); 3) tactile/kinesthetic (learning is best when students are physically engaged in a “hands-on” activities); and 4) auditory/verbal (learning is best when the student is presented with information that is auditory or in an oral format). In this study, the authors focus on the way in which the use of the software programs addresses the auditory and auditory and visual aspects of an online learner.

Online Learners

In the early 2000s, not all instructors were comfortable teaching online. Some even resisted efforts to increase the use of online courses (Lundgren & Garret, 2002-2003). Even with training available, very few instructors intended to use available technology (Garrett et al., 2000). Today, instructors may still be reluctant, because they must cope with various issues including learning new technologies; adjusting to a different pedagogical style; and adjusting to a more learner-driven environment.

According to the National Center for Educational Statistics (2003), students perceived that they learned more through face-to-face instruction and were more satisfied with this method than with online courses. Despite this statistic, empirical studies do not show significant differences between online and face-to-face course performance (Thirunarayanan & Perez-Parado, 2001-2002; Peterson & Bond, 2004).

It is possible that the audio portion of the course contributed to a “personalization” perception. Recent literature concerning information communication technologies (Dennis & Kinney, 1997; Gilman & Turner, 2001; Kock, 2002) shows that elements of audio-rich media delivery have huge potential to enhance student learning, particularly for distance students. These benefits are emerging through the use of Internet-based

videoconferencing (Bland, 2005; Fryer, 2005). The visual richness of Internet-based video conferencing permits access to the multiple cues of natural language, while its synchronicity makes it suitable for activities such as tutorials (Benbunan-Fich & Stelzer, 2002; Blake & Taji, 1997; Gilman & Turner, 2001). The immediacy, flexibility, and visual richness of Internet-based videoconferencing, combined with its increasing reliability enhance possibilities for an enriched kind of learner-centeredness and interactive learning.

Recently, Hallock, Satava, and LeSage (2003) suggested that educators should be able to design online curricula that enhance learning based on students' preferred learning style. Other investigators have found that particular preferences for learning style correlate with academic performance in an online environment (Beadles & Lowery, 2004).

Gellevij and Van der Meij, H. (2002) showed that in a realistic context, multimodal instruction (using more than text) leads to better outcomes than unimodal instruction. Training time is shortened, learning is improved, and cognitive load is not altered. Mayer (1999) supported an integrated design criterion to include the use of visuals in instruction. Screen capture technology allows the instructor to record exactly what appears on his/her computer screen so that the student or viewer can see exactly what transpires as key strokes are made while using a specific software program. Further, Horton (1993) predicted that user motivation would increase because “screen captures” provide visual relief for text-heavy pages and enhance the attractiveness of the printed manual.

These concepts have been advanced for visuals in general (Fredette, 1994; Levie, 1987; Peeck, 1993). Current software from Adobe named Captivate 2 allow the online learner to view whatever is on the instructor's screen. For example, if an instructor used a PowerPoint slide to describe a concept or issue (using a spreadsheet, for example), he/she can embed that PowerPoint slide into a Captivate 2 lecture. This way, the student views both a graphic and how the spreadsheet is designed to solve the problem. Chen and Fu (2003) stated that “multimodal information presentation makes people feel that it is easy to learn and they can maintain attention, which will benefit the learning process and increase the learning performance” (p.359). Shah and Freedman (2003) also support this idea where “visual displays are frequently useful for representing relationships amongst elements that are difficult to explain verbally.” Further, Torres (1985) noted it is possible that using an animated audio-visual format allows students to digest the material using their own filtering systems, whether they are visual and/or auditory.

Extending our discussion to finance courses in particular, the majority of students prefer a hybrid (online/in-class) version of course delivery because they consider finance a subject that is too difficult for online delivery alone (Nicholson & Sarker, 2002). Other researchers have

discovered face-to-face instruction a preferred method, along with making pertinent material available online. Hiltz and Wellman (1997) found that students were more satisfied with virtual classrooms on several dimensions, including access to professors and the overall quality of their educational experience. They thus concluded that student learning – in relation to mastering course material – in online environments was equal or superior to traditional environments (Hiltz & Wellman, 1997).

PROJECT DESCRIPTION

One of the authors has delivered a managerial finance course using WebCT courseware. This environment, with all course material online, allowed discussions, assignment submissions via the web, quiz and test management, and email communication with the faculty member. The specific course taught was delivered 100 percent online within the WebCT environment. The course content area contained weekly chapter sequences with both text and audio-visual lecture material loaded onto a server using the Adobe Breeze and Adobe Captivate 2 Screen Capture programs.

The links to the audio-visual Breeze PowerPoint presentations were embedded as a link in a text lecture or as a clickable link in the course content area. The lectures were sequenced as outlined in both the syllabus and textbook.

The authors are now specifically using this technology to replicate a face-to-face lecture in an online environment. Audio, coupled with a step-by-step animated process, reproduce a life-like chalkboard-type of presentation. The purpose of this study, therefore, was to measure whether this online method of delivery improves students' ability to follow steps involved in problem solving and whether the method has some potential to more clearly explain the steps exposition of by appealing to their learning styles.

METHOD

The Questionnaire

The survey (see Appendix A) consisted of 27 questions divided into four sections. Questions 1-21 used a 7-point balanced Likert scale, with 7 being "very strongly agree" and 1 being "very strongly disagree." The last six questions gathered demographic information. The questions were organized as follows:

- Learning styles: Questions 1-4 were designed to gather information pertaining to whether the student preferred auditory, visual, or both auditory and visual methods of learning.
- Anxiety level: Questions 5-6 determined pre-course anxiety levels.
- Effect of audio portions: Questions 7-11 attempted to determine to what extent the audio portions of the lecture presentations were helpful in addressing issues related to anxiety, mastering the material presented, and making the class more personal.

- Effect of visual portions: Questions 12-16 addressed the visual aspects of the presentations, assessed separately from the audio portions. The questions were specifically designed to extract to what extent the visual aspects were helpful to the student in dealing with his/her anxiety, mastering the material, and making the class more personal.
- Effect of audio and video combined: Questions 17-21 centered on the combination of the audio and visual aspects of the presentations and to what extent, taken together, these addressed issues relating to anxiety, mastering of material, and personalizing the class.
- Demographics: Questions 22-27 were demographic in nature, requesting information about age, income, gender, profession, and what degree program in which the respondent was enrolled.

Data Collection

Surveys were sent to students who had taken one of four courses during the fall 2007 and fall 2008 semesters. These courses were: Managerial Finance (a graduate business course), Investments (an undergraduate business course), Capital Budgeting (an undergraduate business course) and Principles of Finance (an undergraduate business course) at a private Midwest university.

As described above, these courses were taught using Adobe Breeze, an add-on feature to Microsoft PowerPoint, and Adobe Captivate 2, a screen capture program that allows the instructor to display his/her screen to the student viewing the presentation.

A total of 75 surveys were distributed. Sixty-nine students completed the survey, for an effective response rate of 92%. Students were strongly encouraged to complete the survey, although no incentive related to their grade was used. They were told, however, that their participation would help improve the design of the online curriculum and further research related to online teaching methods.

RESULTS

Among those in the sample, 58.5% were female, while 41.5% were male. Status in school indicated that 20.6% were undergraduate business majors; 70.6% were pursuing a graduate business degree; and 8.8% were undergraduate non-business majors. Income ranged from zero to \$250,000, with the mean income after taxes being \$68,107.. Age ranged from 19 years to 59 years, with the average being 35 years old.

Four questions dealt with learning styles (Table 1). A one-way analysis was conducted on the four variables. The ANOVA was significant at the $p < .01$ level. Tukey Kramer multiple comparisons were utilized to detect differences between the means.

Table 1: Learning Styles

Learning Style Question	Mean
1. "I prefer to listen to music than view a piece of art work."	5.3
2. "When doing something new at home or work, I like to see demonstrations, drawing, slides, or posters."	6.3
3. "I often would rather listen to a lecture than read material in a book."	5.8
4. "When learning a new computer application, I prefer diagrams or pictures."	5.8

Note. Items were rated on a 7-point balanced scale with 1 being "very strongly disagree" and 7 being "very strongly agree." Percentages are rounded to the nearest tenth of a percent.

The only significant mean differences, $p = .05$, were found between "I prefer to listen to music than view a piece of art work" and "When doing something new at home or work, I like to see demonstrations, drawings, slides, or poster," "I often would rather listen to a lecture than read material in a book," and "When learning a new computer application, I prefer diagrams or pictures."

The results indicate that some of the respondents seemed to prefer visual learning. Because no other mean differences were found, however, there appear to be a

number of respondents who combine both visual and auditory learning tendencies. There were no gender differences between visual or audio learning tendencies.

Table 2 reports the results related to the anxiety items. A one-way analysis of variance was conducted and yielded a significance level of $p < .01$. Tukey Kramer multiple comparisons were utilized to detect differences between the means. For detection of means differences, the level of significance was $p \leq .05$.

Table 2: Anxiety Levels

Anxiety Questions	Mean
1. "My level of anxiety in anticipation of taking the required finance course was high for various reasons."	4.2
2. "I was somewhat apprehensive about taking a finance course partially or totally delivered online."	3.7
3. "Listening to the audio portions of the presentation reduced my anxiety as it relates to taking this course."	6.1
4. "Viewing the visual portions of the presentation reduced my anxiety as it relates to taking an online course."	6.0
5. "Both the audio and visual portions of the presentations reduced my anxiety as it relates to taking an online course."	6.3

Note. Items were rated on a 7-point balanced scale with 1 "very strongly disagree" and 7 being "very strongly agree." Percentages were rounded to the nearest tenth of a percent.

Items one and two attempted to obtain pre-course anxiety levels. "My level of anxiety in anticipation of taking the required finance course was high for various reasons" had a mean of 4.2 while "I was somewhat apprehensive about taking a finance course partially or totally delivered online had a mean of 3.7. There was no statistical difference

between these two means. This seems to indicate that taking finance courses online presented no additional anxiety for students. This may well be due in part to the fact that most of the participants had already taken online courses with some feelings of success. No gender differences were found in examining initial anxiety levels for taking a required

finance course or being apprehensive about taking a finance course either partially or fully delivered online.

Items 3, 4, 5 from Table 2 asked students to reflect on their experience after the course had been completed. Taken individually, the audio and visual sections of the course both yielded a low sense of anxiety after completing the course. There was no statistical difference between the three post-course anxiety ratings.

All of the anxiety means presented a consistent picture that the new components improved the course in terms of anxiety. One could speculate that that lower anxiety levels would lead to greater overall course satisfaction. This construct, however, was not specifically measured.

Least squares multiple linear regressions were used to determine the relationships between the three anxiety questions and the four independent variables.

The dependent variables were:

1. Audio portions of the presentation reduced my anxiety (Audio model).
2. Visual portions of the presentation reduced my anxiety (Visual model).

3. Audio and visual portion of the presentation reduced my anxiety (Audio/Visual model).

The four independent variables were:

1. "I prefer audio methods of course delivery to written material"
2. "The audio portions of the presentations assisted me in the explanation of the processes which involve multiple steps and formula explanations." (Processes)
3. "Listening to the audio portions of the class made the class more personal in nature." (Personal)
4. "Listening to the audio portions assisted me in mastering the material." (Mastering)

For the visual independent variable questions, the items were phrased the same, except the term "visual" was substituted for the term "audio." Likewise, for the audio-visual independent variable, the dependent questions were phrased the same except that the term "audio-visual" was substituted for the term "audio."

The regression results are as follows:

Table 3: Regressions against Anxiety Levels

Model	F	R	R ²	Standardized Betas		
				t	Weight	Variable
Audio	23.3*	.770	.593	2.1*	.246	Process
				2.8*	.325	Personal
				2.2*	.264	Mastering
Visual	18.3*	.733	.538	3.0*	.311	Personal
Audio-Visual	22.3*	.769	.591	4.2*	.453	Personal

Note. *p ≤ .05 All items were rated on a 7-point balanced scale with 1 "very strongly disagree" and 7 being "very strongly agree."

For the audio model, the positive statistically significant predictors of anxiety scores were:

- "The audio portions of the presentations assisted me in the explanation of processes which involved multiple steps and formula explanations." (.246, Process)
- "Listening to the audio portions of the class made the class more personal in nature." (.325, Personal)
- "Listening to the audio portions assisted me mastering the material." (.264, Mastering)

For all the other models (Visual and Audio-Visual), however, only the variable "Making the class more personal" was significant.

This raises an interesting speculation that adding the new Adobe Breeze and Adobe Captivate 2 Screen Capture components may have given the course a more personal feel and thus led to lower student anxiety levels. These additional modules may have provided a greater degree of intimacy between the instructor and the student. This, too, may well improve overall course satisfaction levels, but is yet to be studied.

Bivariate correlations were run to determine the nature of the relationships between making the class more personal and the questions regarding methods of delivery, the process, and the mastery of course material. Results are presented in Table 4.

Table 4: Correlations against Making the Class More Personal

Question	Making the Class More Personal (Correlations Coefficients)
"I prefer audio methods of course delivery to written material"	.436*
"I prefer visual methods of course delivery to written material"	.280*
"I prefer audio and visual methods of course delivery to written material"	.358*
"The audio portions of the presentations assisted me in the explanation of processes which involved multiple steps and formula explanations."	.586*
"The visual portions of the presentations assisted me in the explanation of processes which involved multiple steps and formula explanations."	.648*
"The audio and visual portions of the presentations assisted me in the explanation of processes which involved multiple steps and formula explanations."	.508*
"Listening to the audio portions assisted me in mastering the material."	.672*
"Viewing the visual portions assisted me in mastering the material."	.588*
"Listening to the audio and viewing the visual portions of the class assisted me in mastering the material."	.490*

Note: $p \leq .05$

The "method of delivery items" did not strongly correlate with "making the class more personal," except for the audio delivery method (.436). The "process that involves multiple steps" items had strong relationships across the audio (.586), visual (.648), and audio-visual (.508) components for "making the class more personal." "Mastering the material" items also showed strong relationships with "making the class more personal" across the audio (.672), visual (.588), and audio-visual (.490) components.

The most likely factors that lead students to feel that the class was personal were being able to "master the material" and the "explanation of process which involved multiple steps and formula explanations."

Least squares multiple linear regressions were performed to determine the extent to which three of the

questions predicted the variable "Listening to the audio (visual, audio-visual) portions of the class made the class more personal in nature." These questions were:

1. "I prefer audio (visual, audio-visual) methods of course delivery to written material only"
2. "The audio (visual, audio-visual) of the presentations assisted me in the explanation of processes which involved multiple steps and formula explanation" (Process)
3. "Listening to the audio (visual, audio-visual) portion assisted me in mastering the material." (Mastering)

Results are displayed in Table 5.

Table 5: Regressions against Making the Class More Personal

Model	F	R	R ²	Standardized Betas		
				t	Weight	Variable
Audio	21.6*	.707	.500	2.2*	.272	Process
				4.3*	.497	Mastering
Visual	8.1*	.277	.277	No coefficient was significant		
Audio-visual	15.5*	.625	.425	2.8*	.536	Process

Note. * $p \leq .05$ All items were rated on a 7-point balanced scale with 1 being "very strongly disagree" and 7 being "very strongly agree."

The audio model was significant at the $p \leq .05$ level. The best positive predictor of making the class more personal was "Listening to the audio portions assisted me in mastering the material," with a weight of .497. A less important predictor was "The audio portions of the

presentations assisted me in the explanation of the processes which involve multiple steps and formula explanations," with a weight of .272.

For the visual model, no independent variable had a significant beta weight while for the audio-visual model, the

only positive predictor of making the class more personal was "The audio and visual portions of the presentations assisted me in the explanation of the processes which involved multiple steps and formula explanations," with a weight of .536. So it seemed that the perceived ability to master material and understand processes which involved multiple steps and formula explanation were keys to developing a personal nature to the "class room."

CONCLUSIONS

This research, which investigated the use of two audio-visual presentation methods, namely Adobe Breeze with PowerPoint and Adobe Captivate Screen Capture, indicates that students had a more personal feeling about the course, experienced reduced anxiety levels, and were better able to master the material and better understand processes that involved multiple steps and formula explanations.

It can also be inferred that using this technology catered to the students' preferred way of learning. This was achieved by implementing multimodal-based enhancements to appeal to both audio and audio-visual learners.

The best predictors that the class was "more personal" included giving the student a sense that he/she had mastered the material and that he/she was able to understand "processes that involved multiple steps and formula explanations." It can be concluded, therefore, that the audio and visual components that were added to the class allowed for a more fundamental understanding of complex concepts.

For this study, it was not clear whether the audio or the audio combined with the visual was more effective. In any case, some combination of audio and video proved to be effective in helping students master the material. The audio and visual aspects of the software programs studied in this research supported verbal communication through the students' ability to see and hear several different visual and auditory cues in a natural language. This increased the personal nature of the learning experience. In the audio-visual lectures, students were given the opportunity to use both their auditory and visual senses. Therefore, if a student preferred to listen to or view a particular concept, as opposed to reading it (or listen and view), they were able to do so. The majority of students consider this aspect of these environments very helpful.

Although not a synchronous experience, the audio piece may have a conversational style and thus replicate a live experience. This aspect of the online experience may have brought the students closer to the faculty and their peers by replicating the live presentation of material as it would have been experienced in a classroom. An important question to be studied, therefore, is whether this could lead to improved satisfaction levels for students and reduced feelings of anxiety.

LIMITATIONS AND FUTURE RESEARCH

Certainly, there are other factors including course material and how the instructor delivers that material that

could also affect perceptions of anxiety and course satisfaction levels. Future research should explore what some of these other factors might be. One of the most important items to assess is how these course improvements affect specific learning outcomes as they have been established by an instructor.

The small sample size and surveying students from only a few finance classes limits this study's ability to generalize the findings. The addition of courses such as statistics, operations research, and economics would prove to be useful data inputs.

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APPENDIX A

1. I prefer to listen to music than view a piece of art work.
2. When doing something new at home or work I like to see demonstrations, drawings, slides or posters.
3. I often would rather listen to a lecture than read the material in a book.
4. When learning a new computer application I prefer diagrams or pictures.
5. My level of anxiety in anticipation of taking the required finance course was high for various reasons.
6. I was somewhat apprehensive about taking a finance course partially or totally delivered online.
7. Listening to the audio portions of the presentation reduced my anxiety as it relates to taking this course.
8. I prefer audio methods of course delivery to written material only.
9. The audio portions of the presentations assisted me in the explanation of processes which involved multiple steps and formula explanations.
10. Listening to the audio portions of the class made the class more personal in nature.
11. Listening to the audio portions assisted me in mastering the material.
12. Viewing the visual portions of the presentation reduced my anxiety as it relates to taking an online course.
13. I prefer visual methods of course delivery to written material only.
14. The visual portion of the presentations assisted me in the explanation of processes which involved multiple steps and formula explanations.
15. Viewing the visual portions of the class made the class more personal in nature.
16. Viewing the visual portions assisted me in mastering the material.
17. Both the audio and visual portions of the presentations reduced my anxiety as it relates to taking an online course.
18. I prefer audio and visual methods of course delivery to written material only.

19. The audio and visual portions of the presentations assisted me in the explanation of processes which involved multiple steps and formula explanations.
 20. Listening to the audio and viewing the visual portions of the class made the class more personal in nature.
 21. Listening to the audio and viewing the visual portions assisted me in mastering the material.
 22. How anxious were you about taking this course?
 23. Age on your last birthday.
 24. Income after taxes (2006).
 25. Gender.
 26. I am a student in the following academic program.
 27. Professional Career or Field.
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