HEARD AND SEEN
Instructor Led Video and its Effect on Learning

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Abstract: This study examined three ways in which instructional designers may create a more efficient learning environment through a better understanding of multimedia learning. First, by using the theories of multimedia learning, we examined a more efficient use of sensory memory. Secondly, the multimedia effect, defined as using visual helps and guides with spoken and written text, was shown to assist working memory in processing new information into existing schema. Last, by using the personalization principle set forth by Clark and Mayer (2008), we will use both the video feed and multimedia together to foster a more social or conversational presentation to the learner.

1 PURPOSE AND OBJECTIVE

This study examined three ways in which instructional designers may create a more efficient learning environment through a better understanding of multimedia learning. First, by using the theories of multimedia learning, we examined a more efficient use of sensory memory. Secondly, the multimedia effect, defined as using visual helps and guides with spoken and written text, was shown to assist working memory in processing new information into existing schema. Last, by using the personalization principle set forth by Clark and Mayer (2008), we will use both the video feed and multimedia together to foster a more social or conversational presentation to the learner.

2 THEORETICAL FRAMEWORK

2.1 Multimedia Learning

Research in cognitive load theory has produced several instructional strategies which have aided instructional designers in developing more effective instructional methods. This study used multimedia learning (Mayer, 2001) because it closely related to the purposes of this study. The goal of multimedia learning is to foster meaningful learning through a better understanding of how we process information. Multimedia learning takes three findings/strategies from cognitive load theory. The multimedia designer uses these three principles of cognitive load theory when creating effective multimedia elements (Mayer, 2001). First, dual coding and dual channel research (Baddeley, 1992; Paivio, 1986) has shown that learners process media information differently whether written, spoken, or graphical. Multimedia learning states the course must be engineered to better utilize these media elements to take advantage of the dual coding/channel nature of working memory. Second, multimedia learning combines the factors that contribute to load such as intrinsic and extraneous load (Sweller, 1999; Sweller & Chandler, 1994) and the limits of sensory and working memory (Mayer, 2001; Miller, 1956; Sweller, 1999). Third, multimedia learning engages active processes such as paying attention to relevant information, organizing, and then integrating it with other knowledge (Mayer, 2001).

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2.2 Personalization Principle

An emerging area of study in e-learning is the personalization principle (Clark & Mayer, 2008). Simply stated, the personalization principle examines the use of a conversational style rather than a formal writing style when presenting learning material to the distance learner (Moreno & Mayer, 2000, 2004). Evidence has emerged that suggests that the voice of the speaker plays an important role and that conversational text may be more effective when heard audibly rather than in written form (Clark & Mayer, 2008). Clark and Mayer also describe pedagogical agents, also known as coaches, which can be cartoon-like characters, talking head video, or even virtual reality avatars. Recent research in this new area has shown that these pedagogical agents using the personalization principle generated more learning than without them (Atkinson, 2002; Moreno, et al., 2001). Some of this research has also shown that there does not appear to be a difference whether the agent is a computer animation or a talking head video (Moreno et al., 2001). The voice of the agent also seems to be important to learning. A recent study where some students were learning word problems from an agent with computer generated voice and some from a human voice found that they learned better from the human voice (Atkinson, 2002; Atkinson, et al., 2005).

3 RESEARCH METHODS

3.1 Subjects

The participants of this study were randomly selected university undergraduate students, ages, 18-22, enrolled in either “Introduction to computers” or “Using computers in a classroom.”

3.2 Procedures

Each participant used an internet browser on a computer connected to the internet to participate in the study. The study was delivered using the web programming language PHP attached to a MySQL database, and consisted of a demographic section, treatment and measurement. The participants first filled out a short demographic survey, which contained the following: name, age, academic progress (grade), gender, and general contact information. Once a participant submitted the demographic survey, the treatment program selected one of four treatments of the same instructional content.

The database used a random reduction rule that randomly assigned the learner to one of the four groups. The next learner was then assigned to one of the three remaining groups. The third learner was assigned to one of the two remaining groups and the fourth was assigned to the remaining group. The fifth learner was assigned to one of four groups and so on until all participants were assigned to a group. This assured randomness in the distribution of the task. After participants viewed the approximately twenty-five minutes of instructional material, they were then given the learning assessment. Once submitted to the treatment program, the database recorded the demographic information, version of the treatment, and assessment score to a serial number in the system for later retrieval and analysis. This was a custom developed web engine for creating and managing data.

3.3 Task

The task was a 25 minute lesson on the history of the internet ranging from Sputnik and the foundation of ARPA (Advanced Research Project Association) to the commercialization of the internet in the early 1990’s. It consisted of a review of the major themes and concepts to set the stage for the learning material followed by a quick summative review to assist in schema construction. Then, the core lesson was delivered to the learners followed by a review of the major themes and concepts to assist working memory in correlating the new information with previously held schema.

This information was chosen to give the research a more universal audience without being too specialized in any one field or curricula. Also, it had the ability to appear relevant to the student but had no actual impact on their course outcome unless the instructor wished it. Therefore the instructor could apply the lesson to a standard e-learning course without the study causing perceived interference with course outcomes.

This study tested three hypotheses.

1. There will be no statistically significant difference between instruction delivered with instructor led video and instruction delivered without instructor led video.
2. There will be no statistically significant difference between instruction delivered with multimedia elements and instruction delivered without multimedia elements.

3. There will be no significant interaction effect between instructor led video and multimedia elements in instruction.

3.4 Independent Variables

Two independent variables were used in this study: (1) instructor led video and (2) supportive multimedia elements. Each independent variable had two conditions; it was present or not present. Instructor led video is the actual video image of the instructor teaching. It has been commonly referred to in the industry as talking head video. Instructor led video is processed by working memory as video in the video channel of sensory memory.

Multimedia presentation was the second independent variable used in this study. Multimedia was utilized in the forms of graphics, charts, outline of program content, etc.; thus, augmenting the presentation of the core learning material presented in the study. Similar to instructor led video; multimedia also utilizes the video channel of sensory memory in working memory.

3.5 Dependent Variables

The dependent variable was a score obtained on a post-test taken immediately following the 25 minute presentation. The post-test consisted of 15 questions about the material in the lesson. The test reviewed the major concepts, dates, people, and places of the lesson. The questions addressed several sections of Bloom's Taxonomy from knowledge and understanding through application and analysis. Each of the four groups received the same post-test.

3.6 Experimental Design

An experimental post-test only 2X2 factorial design was used to examine the effects of instructor led video and multimedia learning on the learning task. The design consisted of four equal groups: three treatment groups and one control group.

3.6.1 Groups

Group 1 - video was present but not multimedia elements.
Group 2 - both video and multimedia were present.
Group 3 - neither video nor multimedia elements were present.
Group 4 – multimedia was present but not video.

The groups were chosen at random using the distance learning engine developed for the study. A Two -Way Analysis of Variance (ANOVA) was used to analyse the data from each of the four groups. An alpha of .05 was chosen as the minimal alpha for this study.

4 RESULTS

Dependent variables in the form of quiz scores were obtained at the end of each lesson. Test scores were derived as percentage correct on a 100 point scale. To determine the difference attributed to treatments, the mean of the quiz scores from each group were examined using Two-Way Analysis of Variance (ANOVA) along with Cohen's D for effect size (Cohen, 1988).

We can see that the video only and audio only groups (groups 1 and 3) had virtually identical means (M=71.55, N=29 and M=70.28, N=32). However, group 4, multimedia only, scored slightly higher (M=75.78, N=32) than groups 1 and 3. The best performing group was group 2 with a mean of 81.25 (N=31).

The research questions asked: "What impact does the video feed of the instructor delivering information via lecture have on learning?" and "How will multimedia impact the learning process?" An online learning delivery system was developed to present learners with an environment that tested the three hypotheses. This system had four variants of the same instructional content which resulted in four different treatments.

Fisher's Two-Way Analysis of Variance was used to examine the data further.

The analysis of variance shows that the data is statistically significant at the .05 level, the main effect for multimedia, F =11.042 (p=.001) with an effect size of d=.083. This main effect indicates that there is a significant difference when multimedia is present. Group 2 and group 4 combined for an average mean of 78.47 and were significantly different from the average mean of 70.89 from group1 and group 3. Video by itself had almost no effect. When video was present the mean was 71.55 and when video was absent the mean was 70.29. This demonstrated an insignificant main effect for video, F=2.168 (p =.144) with an effect size of .017. These results suggest that it is the combination of media that significantly impact learning process and not merely the addition of one media such as video.
This study indicates that course designers need to examine the role in which each element plays. When listening to the individual instruments play in an orchestra, the music does not deliver the message

intended by the composer. However, when the instruments all play together and in harmony, the audience hears and experiences the music as intended. It is the harmony we must seek as course designers. This study was unique in that it allowed the presentation of the same learning content in four different ways. No other study was found that could offer comparative research. More research using this type of engine needs to be done to further explore the relationship between the different media types. This will assist course designers in developing quality learning material that maximizes the way in which our brain processes information. This understanding contributes to designer identifying practices for quality online teaching and learning and provides higher education educators and administrators with conceptually grounded research to guide decisions about technology adoption.

REFERENCES

Atkinson, R. K., 2002. Optimizing learning from examples using animated pedagogical agents. *Journal of Educational Psychology*, 94(2), pp.416-427.

Atkinson, R. K., Mayer, R. E., & Merrill, M. M., 2005. Fostering social agency in multimedia learning: Examining the impact of an animated agent's voice. *Contemporary Educational Psychology*, 30(1), pp.117-139.

Baddeley, A. D., 1992. Working memory. *Science*, 255(5044), pp.556-559.

Clark, R. C., & Mayer, R. E., 2008. *E-leaning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* 2nd ed. San Francisco: Pfeifer An Imprint of Wiley.

Mayer, R. E.,2001. *Multi-media learning*. Santa Barbara: Cambridge University Press.

Miller, G., 1994. The magical number seven, plus or minus two: Some limits in our capacity for processing information. *Psychological Review* 101(2), pp.243-253.

Moreno, R., & Mayer, R. E., 2000. Engaging students in active learning: The case for personalized multimedia messages. *Journal of Educational Psychology*, 92(4), pp.724-733.

Moreno, R., & Mayer, R. E., 2004. Personalized messages that promote science learning in virtual environments. *Journal of Educational Psychology*, 96(1), pp.165-173

Moreno, R., Mayer, R. E., Spires, H., & Lester, J., 2001. The case for social agency in computer-based teaching: Do students learn more deeply when they interact with animated pedagogical agents? *Cognition and Instruction*, 19(2), pp.117-214.

Paivio, A., 1986. *Mental representations: A dual coding approach*. Oxford: Oxford University Press.

Sweller, J., 1999. *Instructional design in technical areas.* Victoria: Acer Press.

Sweller, J. & Chandler, P., 1994. Why some material is difficult to learn. *Cognition and Instruction*, 12(3), pp.185-233.