

Effectiveness of Audio on Screen Captures in Software Application Instruction

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Presentation of software instruction has been supported by manuals and textbooks consisting of screen captures, but a multimedia approach may increase learning outcomes. This study investigated the effects of modality (text, audio, or dual) on the achievement and attitudes of college students learning a software application through the computer. Participants in this study were presented with three variations of instruction over a software application. Differences between text only, audio only, and dual modality conditions were measured by achievement on a posttest, and attitudes toward instruction were collected by survey. Results from the research indicated no significant effects were found in the Analysis of Variance (ANOVA) for the modalities in test scores. However, statistical significance was found in two of the attitude items. First, dual modality was preferred in learning computer applications. Second, audio did not appear to assist the learner in remembering factual information. These results assist instructors and corporate trainers in presenting software applications effectively and efficiently in their respective occupations.

PURPOSE

E-learning has potential for corporate, K-12 education, preservice teacher education and inservice professional development in providing an effective model of instruction in software applications. Instruction in software applications at the educational level is generally taught by textbook and on-site classroom professors with Infocus projectors; however, the Internet has provided the bridge in reaching learners outside the classroom walls. Instruction, online and on site, tends to rely heavily on textbook usage in teaching software concepts and textbooks tend to use screen shots to visually guide the learner. What is lacking in many online courses is a multimedia approach, which can be provided through a variety of software tools. Exploring through research, the design and delivery of presenting instruction electronically for teaching software applications is the focus of this study.

Theoretical Framework

Textbooks and software manuals with screen shots are the most common ways of teaching students to learn software programs. To effectively learn a software program, a student must be able to navigate through the program and produce the desired results of a particular task given to them. Screen shots in software manuals support development of a mental model, identification and location of screen objects, and verification of screen states (Gellevij, Van der Meij, de Jong & Pieters, 2002). The use of text-picture combinations in studies conducted by Gellevij, et al. (2002) found no increase on the cognitive load and an increase in effectiveness and efficiency in student learning. Clearly, screen shots in manuals aid the learner, but would the addition of audio with graphics (screen shots) further increase learning efficiency over just text and graphics?

Research studies in multimedia learning have indicated that learning outcomes are higher when visual materials are accompanied by audio over text alone (Moreno & Mayer, 2001). This rise in increased learning with the addition of audio is known as the modality principle (Mayer, 2001). Mayer's findings through a variety of research studies found that students with multimedia messages tend to learn more with spoken text over printed text. Paivio's dual-coding theory is the underlying support of lowering the cognitive load by presenting content through the auditory and visual channels (Mayer, 2001). There is growing support that providing instruction through more than one modality has a positive effect on student learning (LeeSing & Miles, 1999).

Students who learn through textbooks or software manuals use text and graphics only. The implications of dual coding research suggest that adding audio with screen shots over text with screen shots might increase learner efficiency. The Gellevij et al. (2002) studies on software manuals did not support testing of dual coding because text and pictures are processed through the same channel. To study whether audio increases learner efficiency in software instruction implies using a multimedia product that supports audio.

Koroghlanian and Sullivan (2000) have stated that there is little research on how exactly audio should be incorporated into multimedia or computer-based instruction. Care should be taken on which media design is used to maximize the efficiency of instruction. Will the learner have control or not? Is text needed? When presenting material where the learner does not have control of the pacing, Moreno and Mayer's (2001) findings support removing on-screen text. Therefore, in this study one presentation included graphics and audio only.

In this study, presentation of screen shots with text, screen shots with audio, and screen shots with text and audio will extend the research in dual coding of instruction for software applications. The research question explored in this study was: What are the effects of modality (text, audio, or dual) on the achievement and attitudes of college students learning a software application through the computer?

METHOD

Design

The study explored the learning and attitude effects of modality in presentation of a software application. A multimedia lesson was designed to present in three modalities: screen shots with text, screen shots with audio, or screen shots with text and audio. The independent variables were the modalities; dependent variables were posttest scores and attitude effects. Expectations were that students with the modality condition of screen shots with text and audio would learn better than students having only text or audio alone.

Subjects

Forty participants from a large southwestern university were randomly assigned to one of three conditions in a one-factor (presentation type) exper-

imental design. Participants were 37 females and 3 males with the majority of the participants (28) within the 17-21 age range. Participants were drawn from two undergraduate educational application technology courses for elementary educational majors. Participation was voluntary; incentives for participation were provided at the discretion of the instructor. All students elected to participate. The instructors were not aware of the posttest scores of the individual students on the computer based instructional lesson. Participants' computer skills averaged at 3.13, with 5 being an expert to 1 being a novice. Participants' average Internet use was between 10 to 15 hours, with time spent most in communication (email), followed by research, entertainment and news, respectively.

Materials

A 20-minute instructional lesson on the computer application *Microsoft Access* was developed using Qarbon's *Viewlet*, which creates a Flash animated presentation. The multimedia lesson of 83 slides had the lesson's objectives at the beginning of the program with an introduction slide for each function in *Microsoft Access*: the find command, queries, filters, and sorting. Although, learner control was available on the flash presentation, students were instructed before starting the instructional lesson not to use the start, play, pause, and end buttons, but to allow the automated presentation to proceed on its own.

Each lesson contained the same screen shot images of Access. Differences between the text only, audio only, and dual modality conditions occurred throughout the programs with respect to how verbal information was delivered (i.e., how screen shots were annotated and how Access procedures were explained). As implied in the condition names, the text only condition used only text, the audio only condition used only audio, and the dual modality condition used both audio and text. Audio narration of the text was delivered through headphones.

Content for the lesson was from a published textbook on *Microsoft Office*. The 20-item paper and pencil posttest was constructed from the publisher's multiple test questions and from modifying the publisher's completion and true/false questions to a multiple choice format. The ten Likert-type items attitude survey and demographics sheet were constructed from a similar research project on modality, modified to fit the modalities of this particular lesson.

Procedure

Each computer in a PC lab containing 24 computers received one of the three versions of the Access computer lesson. The Access lesson covering the find command, queries, filters and the sorting function was displayed in a series of 83 automated slides. Screen shots of the Access product were taken to depict the various functions with captions for text, and audio narration of the text where applicable per modality. The duration of the audio presentation was about 20 minutes.

An introduction to the type of lesson and the research project was given before the participants launched the computerized lesson. Participants were instructed to place the headphones on before starting the lesson and were shown where the volume controls were located on the computer desktop. Participants were allowed take the paper and pencil multiple choice test created over the items of the Access lesson immediately after the lesson concluded. An attitude survey of modality preferences over the lesson with some demographics was also administered after the lesson.

Data Sources

The criterion measures for this study included an immediate posttest, an attitude survey and a demographic survey. The posttest consists of a 20-item multiple choice paper-and-pencil instrument designed to measure student achievement on the content of the computer program. Scoring was completed on a 100 point scale, at 5 points per question. The attitude survey contains ten Likert-type items on a 5-point scale from 5 (strongly agree) to 1 (strongly disagree).

RESULTS

Hypothesis: Students with the modality condition of screen shots with text and audio would learn better than students having only text or audio alone. An alpha level of .05 was used for all statistical tests. Due to the fact that there was an uneven representation of males (3) and females (37) gender was NOT addressed as a variable.

The hypothesis was not supported. No significant effects were found in the Analysis of Variance (ANOVA) for the modalities in test scores: $F(2, 37) = .963$, $p = .05$. A Fisher's F ration of .963 was observed.

ANOVA did reveal statistical significance on two attitude items. For the item "I would prefer to study this material on a computer rather than on paper," those in the dual modality condition expressed significantly more agreement with this statement ($M = 4.54$) than those in the audio only condition ($M = 2.69$), $F(2, 32) = 4.50$, $p = .019$. The item "Listening to the audio about Access helped me to remember the factual information about Access," both audio modalities, dual modality ($M = 3.38$) and audio ($M = 2.54$) significantly expressed agreement at $F(1, 24) = 6.10$, $p = .021$, where audio did not make a difference in remembering factual information.

There was no additional statistical significance found in the modality and general survey questions. Cronbach Alpha of the test reliability was at .425.

Significance of the Study

The first question of whether the modality of presentation affects learning has implications on improving training and instruction where time is a constraint. If students can learn faster with improved instruction, more content can be taught within a semester or in the corporate world, less training time equals more production. The second question of whether student learning of computer applications is influenced by modality, purposely through raising or lessening the cognitive load, concerns student achievement. If positive effects of dual modality in presentation can enhance student learning and efficiency, instructors should incorporate these findings in instruction of software applications.

Although, this study showed no significant findings in dual modality raising post test scores, a larger sample may show significance. Also participants with text alone proceeded at a faster rate than the audio in completion of the program. Controlling the timing may contribute to changes in significance.

The significance of the attitude survey suggests that although students do not feel the audio enhances their memory skills, students prefer a multimedia approach, dual modality, in presentation style.

Participants in the study made several comments about the computer based lesson. First they requested learner control of the program, where they could proceed, pause, or return to prior slides in the presentation. Participants felt an interactive element would help them remember procedures and information along with a project over comprehension rather than a multiple choice test.

As software instruction is advancing to the online environment, providing the best medium of presenting course material over the Internet provides a service to instructors and students in final student outcomes. The search for effectiveness in instructional methods in software presentations that employ dual coding to improve student learning is of interest to educational instructors and corporate trainers.

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