2004

Integrating Multimedia: Demonstrations of Student-Generated Multimedia Products Made within Regular Content-Driven Courses

Mathew Mitchell
University of San Francisco, mitchellm@usfca.edu

P Andreatta

Elena Capella
University of San Francisco, capella@usfca.edu

Integrating Multimedia: Demonstrations of Student-Generated Products made within Regular Content-Driven Courses

Mathew Mitchell
School of Education / University of San Francisco
United States
mitchellm@usfca.edu

Pamela Andreatta
School of Education / University of San Francisco
United States
andreattap@usfca.edu

Elena Capella
School of Education / University of San Francisco
United States
capella@usfca.edu

Abstract: Education doctoral students in five different courses demonstrated their understanding of key concepts though creating multimedia learning products. This demonstration looks at the use of student-generated multimedia products as a pedagogical strategy to encourage learners to think more deeply about academic content. This demonstration shares over 20 different multimedia products from these different courses. The products are encouraging since students demonstrated a deeper level of academic understanding and a higher level of student engagement.

Introduction

This investigation was conducted with doctoral students in education. Over a period of three years, students in a variety of courses taught by the first author were required to demonstrate their understanding of key course material through the creation of multimedia learning products. This demonstration provides snapshots of how students responded to these new challenges, what seemed to be the major benefits, and the major hurdles in developing such an approach to regular content-oriented courses (as contrasted to courses that are primarily technology-oriented). The potential implications of this investigation go beyond that of doctoral-level courses for students in education. The implications of this study may apply to other content courses containing 30 students or less at the undergraduate, masters, or doctoral levels. The essential requirement is that the primary focus in the course needs to be on the integration and critical synthesis of course content.

Why Multimedia?

Multimedia can be de?ned in a variety of ways, but in this paper the term "multimedia" refers to an educational presentation made using audio and images. Unlike hypertext and web-based instruction, for example, the reliance on written text *per se* is minimized (though not eliminated) in a multimedia product. While multimedia has been considered high in potential as a tool for educators, one key hurdle to using multimedia is the perceived problems of integrating technology into a regular content-driven course.

One of the main sources of scienti?c evidence supporting multimedia learning is Mayer's body of research (2001). His research over the past ?fteen years provides the practical grounding for this study. In *Multimedia Learning* (2001) Mayer proposed seven principles of multimedia design based on several research study ?ndings, plus two potential principles based on preliminary research. Mayer's nine guidelines could easily be collapsed and re-organized into six key guidelines: integration, parsimony, narration, individual differences, personalization, and interactivity. *Integration* sums up research that indicates that audio/text need to be highly integrated with the images.

Parsimony indicates that there is better learning when extraneous words, sounds and pictures are excluded. *Narration* indicates that learning is better when words are presented as narration rather than as text. *Individual differences* indicates that learning is better if the target audience has low-prior knowledge of the content ?eld *and* that they have high spatial ability. *Personalization* suggests that students work harder at learning when they feel involved with the presentation. Two recent studies (Moreno & Mayer, 2000; Moreno & Mayer, 2004) found personalization could be achieved simply by the narrator using a conversational style of voice rather than relying on a third-person voice. *Interactivity* suggests students learn better when they can control the pace of the presentation. These six guidelines provide a useful and practical framework for designing *effective* learning experiences using multimedia.

Students in these foundational-level statistics courses were essentially being asked to be multimedia authors designing a learning experience for "new" or "low prior knowledge" future students. Just as Mayer found that products adhering to the six design guidelines led to increased retention and transfer of knowledge, so it was reasonable to infer that if student-generated products were made using some of these same guidelines then learning of the student-authors may also be enhanced. The instructor-imposed constraints of the multimedia challenges were such that student products needed to include integration and narration. Furthermore the guidelines students were given highly encouraged them to make their products parsimonious, to assume their audience had low-prior knowledge, and to consider making their audio narration conversational in tone (personalization). Mayer's guideline of interactivity, however, was not practical to require in the products for a variety of technical reasons.

The major theoretical lens guiding the rationale for using multimedia challenges was provided by the work of Benware and Deci (1984) on active-learning. They hypothesized that "... learning material to teach it will lead to enhanced learning and to a more positive emotional tone than learning material to be tested on it, even when the amount of exposure to the material being learned is the same." (p. 756). Benware and Deci thought that students would learn better if the content of the instruction was useful for a task or activity they were undertaking. The logic behind this line of thinking is straightforward: students approach the material with the anticipation of using it, so they become more fully involved. Benware and Deci's research, as well as the subsequent research of others, has indicated that active-learning approaches can be quite effective. More recently, Marks (2000) provided evidence that suggests *authentic instructional work* in general may lead to higher levels of student engagement. Since students in the study's statistics courses were put in the position of "learning in order to teach others" through an authentic instructional challenge, it was important to assess how students perceived these new multimedia challenges: did they feel more "engaged" with the material and was their motivation to learn enhanced?

Students in nine courses offered over a three-year period (including beginning-level Statistics, Creativity, Motivation, Cognitive Psychology, and an advanced instructional design course) were essentially asked to be multimedia authors designing a learning experience for "new" or "low prior knowledge" future students. Thus it made sense to assess to what degree students implemented Mayer's design principles when creating their own learning products. Just as Mayer found that products adhering to the six design guidelines led to increased retention and transfer of knowledge, so it was reasonable to infer that if student-generated products were made using these same guidelines then learning of the student-authors was also likely to be enhanced.

In summary, this demonstration session shares some of the resulting student products that emerged from the challenge of creating multimedia products that would teach future students about key concepts and theories in five different courses. Did the resulting student products seem solid from a multimedia design perspective as delineated by Mayer (2001)? Did the conceptual rigor of the content of these products indicate a better understanding relative to previous incarnations of the various courses? Did the experience of making such products within an active-learning environment seem to lead to a fuller engagement with the material and increased student motivation? The selection of student products that will be shared help provide some insight into these questions.

Participants and Context

Students

The subjects were students enrolled in an education doctoral program. The students were in one of five courses: foundation-level statistics, Motivation, Creativity, an advanced-level instructional design course, or Cognition. Many of these students are relatively unsophisticated when it comes to technology and would not on their own choose to take a technology intensive course. The students usually live from 20 to 200 miles away from the campus. This pro?le of the students framed the constraints that the instructor had to consider when incorporating technology

into the course. Most of the students are in the 35-55 age range. In particular, there were ?ve major constraints that subsequently guided the choice of software and the pragmatic nature of the multimedia challenges:

1. The multimedia project requirements needed to be accomplished on a student's home computer. It was unfeasible to assume students would be able to make use of the university's computer lab resources.
2. The software used needed to run on both Windows and Macintosh operating systems.
3. The software needed to be affordable since it was included in the total course costs along with traditional materials such as textbooks.
4. The software needed to be powerful in terms of the products it could create, but also simple to learn.
5. It was unreasonable (for a variety of technical reasons) to assume that students could create their audio ?les at home.

This combination of constraints led to the selection of *LiveSlideShow* (Totally Hip Software, 2001) as the software used with students. It was affordable (under $30), worked on both operating systems, was relatively simple to learn, and had the potential for creating powerful multimedia products.

Learning to Create Multimedia

LiveSlideShow was originally created for the "photo enthusiast" market to create slideshows where static images are placed in a timeline, with transitions between those images. *LiveSlideShow* allows the user to include audio as a background track. *LiveSlideShow* was particularly useful (compared to other potential products) because it allows for individualized timings of images—a key factor in creating tightly integrated educational multimedia. The final product exported from *LiveSlideShow* is a *QuickTime* movie (Apple Computer, 2002) that can be played on any computer. The ability to integrate audio and visual tracks was essential to *LiveSlideShow* being chosen as the software incorporated in these exploratory courses.

It was reasonable to assume students could construct their multimedia products at home in terms of the creation of images and integrating those images with the audio track. Students created images using digital cameras, scans, simple illustration or presentation software, or they found images by conducting web searches. With regards to audio the instructor arranged for students to come to his office to record their narrated script. Later, students could download the resulting MP3 file from the class website.

A statistics course, especially at the foundation level, is time-intensive and so in-class time for extras such as multimedia instruction is not easy to find. It was crucial that the instruction provided for learning the *LiveSlideShow* software *minimally* disrupt in-class time for presentations and discussion. In the course about three hours total of in-class time was used to address software learning issues. This was supplemented with a tutorial CD providing support for out-of-class learning of the software. Each of the major components of the software learning process is discussed below.

- *In-Class* Tutorial: A total of 3 hours of in-class tutorials were conducted to help students understand the basics of using the LiveSlideShow software program. These tutorials were primarily stand-and-deliver presentations given over two different class meetings.
- *Text Guide:* The in-class tutorial was supplemented with a text guide containing many screen shots showing them how to do various operations in *LiveSlideShow*. The guide (written by the instructor) was meant to be closely aligned with the type of course requirements students would be fulfilling.
- *QuickTime Tutorial Movies:* These movies were probably the most critical factor in students being able to learn the software in a timely manner, as well as being a medium for presenting advanced topics to those students interested in learning about them. The *QuickTime* movies provided students with a way to watch and hear how to do things in *LiveSlideShow* and other software programs such as *Photoshop Elements* and *QuickTime Pro*. The ability to stop a movie, go into *LiveSlideShow* to try out a procedure, then return to the movie was crucial for many students being able to grasp how to implement various procedures.

Multimedia Learning Products

The specific requirements changed somewhat from the time of the first time multimedia challenges were incorporated into a course (Fall 2001) through the most recent versions (Spring 2004). However, in all courses students had to create at least audio tracks to explain their material. The length of the audio tracks varied, but the typical length of an audio track was between 7 and 15 minutes: long enough to create a multimedia overview of the concept. In all courses students had to create at least one full multimedia presentation (integrating both visual and

audio material) based on the audio tracks. Over time it became apparent that the audio track was always the backbone of the final multimedia presentations. On the one hand students were pleasantly surprised at the quality of their audio tracks. (Note: these were always recorded with good equipment in the instructor's office.) In addition, this backbone of the multimedia project required almost no multimedia-making knowledge. Instead it required students to put together a pithy, clear and engaging storyline regarding the specific topic they were trying to teach future students about. There was great variety in terms of how students created their audio tracks. For example some students included background sounds (such as ambient sounds or a music track). More substantively students used a variety of approaches including: single narrator, a dialogue between two people typically in the format of expert/novice dialogues, case study audios that used a main narrator and several characters, and in-the-field audios that included a narrator supplemented with audio clips from real people in the context they were describing (such as an academician talking about his theory or students talking about their products made at a science fair).

At the beginning of the course students were provided with some examples by previous students of multimedia products that could be created using the *LiveSlideShow* software (with the exception of the first two courses in which multimedia challenges were used). Students were also provided with in-class and out-of-class instruction in how to use *LiveSlideShow* and in the basic creation of educational images. Students created images using a variety of tools including hand-drawn images that were subsequently scanned, PowerPoint images, more complex images created in Photoshop Elements, and many other sources.

Typically the most difficult part for student to accomplish technically was the tight integration needed between images and audio. However, generally speaking it was not the software product that was problematic as much as the challenge of paying great attention to detail with regards to timing. The emphasis on grading the multimedia products was on the quality, correctness, and thoroughness of the content—not all the snazziness of their images.

Demonstrations

Over twenty student multimedia products will be available for viewing using three laptop computers. The topics displayed will cover the full range of challenges across the 5 courses that used this student-generated multimedia approach. The demonstration movies will show a variety of technical approaches that students have taken when meeting these challenges including cartoon-style animations, case studies, multiple characters within a movie, and many other approaches for creating effective multimedia learning products using *LiveSlideShow*. Just as important is the variety of approaches used in creating their audio tracks. Finally the demonstrations will include excerpts from student interviews about their perceptions regarding the usefulness of student-generated multimedia for enhancing and deepening their learning experiences. Brief descriptions of the five courses that used student-generated multimedia assessments are provided in the below paragraphs.

Cognition: This is a course that all first year students in the first author's doctoral program need to take. Products from two versions of this course (Spring 2003 and Spring 2004) will be on display. The requirements for these two courses were essentially the same. In both courses students had to specialize in one specific theory. In addition to creating a movie explaining the theory to novices they also needed to write a mini-literature review of research exploring the theory. These movies are from 7 to 13 minutes in length.

Statistics: This is a course that all first year students in the School of Education's doctoral program need to take. Products from four versions of this course (Summer 2002, Spring 2003, Summer 2003, and Fall 2003) will be on display. The requirements for these the four versions of the course were essentially the same. In each version of the course students were randomly assigned statistical concepts that they had to create a movie about. The movies are from 8 to 18 minutes in length.

Creativity: Products from two versions of this course (Fall 2001 and Fall 2003) will be on display. The learning challenge for students in both course versions was very similar. The course members viewed a number of video interviews with creative individuals in class and then read several additional interviews outside of class. In addition they had a couple of textbooks that helped round out their readings. The first product that students produced was a "model of creativity." The purpose of the challenge was for students to synthesize and integrate the various themes that had emerged as significant variables across the interview material they had seen/read. The second product was to then build a bridge in which they highlighted particular variables in their model that may be able to be used to enhance the quality of academic instruction. Samples of the second "Bridge" project will be shared. The Bridge movies are from 7 to 26 minutes in length.

Instructional Design: Products from the version of this course offered in Fall 2003 will be on display. The

course had one integrated learning challenge: based on course readings and class discussion, create your own model of instructional design. Then using this design show how it could be applied to the revision of a course you already teach or in the creation of a new course. These model-application movies were typically 12-18 minutes in length.

Motivation: Products from two versions of this course (Spring 2002 and Spring 2004) will be on display. The requirements for these two courses varied somewhat. In both versions of the course students were required to specialize in one specific motivational theory (after having completed reading/discussion of a general textbook). In the Spring 2002 course students were also required to make a second movie about what were the most powerful variables they would identify (across the theories) to use to enhance student motivation to learn. In the Spring 2004 course, however, students integrated the first movie explicating a specific theory with a second part that showed how that particular theory might be put into practice within a specific educational setting that the student-author was familiar with. The movies are from 8 to 20 minutes in length.

Student Interviews

A set of student interviews will be included amongst the demonstration materials. One set of interviews were conducted in 2002 with some of the students who experienced the initial versions of these multimedia-making courses. The second set of interviews were conducted in 2004 with students in the Cognition and Motivation courses. These interviews will provide an audio snapshot into student perceptions about the value and difficulties inherent in integrating student-generated multimedia products into regular content-driven courses.

.

Discussion

A preliminary analysis of student products indicates that they incorporate three aspects of Mayer's multimedia learning model plus one new category: integration, parsimony, personalization, and greater attention to detail. Furthermore there seemed to be two specific motivational benefits of having student-generated multimedia products incorporated into the learning experience: personalization (again), and embracing new challenges.

Integration. Virtually all of the student products display a high level of integration. That said, it was easier for some students to practically implement such integration. One of the common requests from students was help in how to organize their work so that this process of integration (or "timing" as the issue plays out in LiveSlideShow) was simpler to conduct. This was apparent both in informal student comments and in structured student interviews.

Parismony. Differences in the quality and effectiveness of student products could partially be explained by parsimony. Usually student audio tracks were fairly parsimonious, but there was great variance in how students used images. In some student products images were too often used as "?ller" whereas in other products every image seemed necessary. Many students recognized the need and value for parsimony in their products. Both in informal comments and formal interviews, students noted that the structure of the assignments encouraged them to distill the essence of a theory in order to communicate it clearly and effectively in a multimedia format. Many said that the simple act of recording an audio script solidi?ed their understanding of the content, so much so that even 3-9 months after the courses ended many still remembered and could discuss their presentations ?uently.

Personalization. Mayer used this term to refer to the use of a ?rst or second-person voice in the narration. Every student's product had this basic level of personalization. However, a surprising result of these initial multimedia products is that they seemed to encourage students to make very personal connections with the academic material. As one student noted, "Multimedia has given me a chance to develop a personal relationship with the topic....when I do a multimedia project I do much more re?ection on the subject matter (relative to a paper). I strive to develop a personal vision of the material that goes beyond words. I am surprised at how much this intensi?es my understanding of the material."

Greater Attention to Detail. One student noted, "Doing multimedia projects has given me more planning skills. Once I pick a topic, I need to begin planning the timelines and storyboards. A multimedia presentation is dependent upon the completion of multiple sub-tasks. The presentations I have done have given me an opportunity to develop more planning skills." Since statistics per se is rigorous both in terms of conceptual understanding and details, the inherent demands of multimedia production to be aware of details may have helped elevate the level of detail students similarly gave to understanding statistics.

Embracing New Challenges. Many students noted that these projects challenged them in new ways, demanding them to rethink how they communicate essential ideas. It wasn't just the challenge of using visual

material, or the challenge of using audio material, but the unique requirements when one tries to integrate these two modes of communication.

Summary

These initial demonstration movies resulting from using multimedia within a regular content-driven course are highly encouraging. In essence, the challenge to create effective multimedia products appeared to result in students thinking more carefully about the effective design of multimedia learning experiences as well as leading to a higher level of student engagement with the academic content of the course. These results are indicators of an increased level of student learning compared to earlier versions of the same courses taught by the same instructor. Yet how far, really, can such an approach be used with effectiveness in higher education? For students who are also educators there is a natural ?t as the multimedia products challenged them to think more deeply about what it means to learn and how to communicate effectively. Multimedia also required students to pare down to the core of a theory/concept to determine which parts of the theory/concept were essential.

The apparent increase in student engagement in these courses suggests that the general approach may have a wider applicability than just in courses with doctoral-level education students. It is hard to know at this point, but student-generated multimedia products may be a viable way to increase student engagement within a fairly wide range of academic disciplines where the primary emphasis is on the integration and critical synthesis of course content.

References

Apple Computer (2002). QuickTime, Version 6 [computer program]. Palo Alto, CA.

Benware, C.A., & Deci, E.L. (1984). Quality of learning with an active versus passive motivational set. *American Educational Research Journal, 21, 755765.*

Marks, H. (2000). Student engagement in instructional activity: Patterns in the elementary, middle, and high school years. *American Educational Research Journal, 37 (1),* 153-184.

Mayer, R.E. (2001). *Multimedia learning*. Cambridge, England: Cambridge University Press.

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

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

Totally Hip Software (2001). *LiveSlideShow,* Version 2 [computer program]. Vancouver, Canada.