Creating Student-Generated Multimedia: Benefits and Challenges for Teacher Education

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Abstract

Schools of education across the United States are increasingly required to integrate, support, and enhance technology into teacher preparation programs. This article examines the benefits and challenges of using student-generated multimedia with teacher education students. In lieu of a traditional examination or research paper, students enrolled in two undergraduate teacher education courses were required to create multimedia movies on selected course content. Results of this study are discussed in relation to six key themes of Mayer's (2001) cognitive theory of multimedia learning: *integration, parsimony, narration, personalization, individual differences, and interactivity*. Recommendations for further research are provided.

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Introduction

In response to the requirements of national accreditation groups such as the International Society for Technology in Education (ISTE) and the National Council for Accreditation of Teacher Education (NCATE), schools of education are increasingly required to integrate, support, and enhance technology into teacher preparation programs (Vermillion, Young, & Hannafin, 2007). Many schools, colleges, and departments of education across the United States are rethinking how they prepare tomorrow's teachers to use technology (Rowley, Dysard, & Arnold, 2005). Those who prepare teachers in the current information age are nearly unanimous in their recognition of the need to incorporate technology in some fashion that requires preservice teachers to acquire both confidence and competence in this area (Beasley & Wang, 2001). Research suggests that increased use of technology enhanced learning practices in PK-12 teaching is more likely when prospective teachers experience a variety of computer uses in the majority of their undergraduate courses (Wheatly, 2003).

Many teachers, however, lack the knowledge, preparation, and training to integrate technology in the classroom (Grunwald and Associates, 2010). A recent study commissioned by the Richard W. Riley College of Education and Leadership found that teachers who have completed their initial certification or licensure since 2000 do not believe that their preservice programs taught them how to teach 21st century skills or how to effectively incorporate technology into instruction (Grunwald and Associates, 2010). Initial efforts to integrate technology into teacher preparation typically focus on a single, standalone course on educational technology (Gronseth et al., 2010; Hofer, 2005) with an emphasis on personal productivity and information presentation (Gronseth et al., 2010). It has been noted that standalone information

technology coursework does not correlate well with technology skills and the ability to integrate technology into teaching (Milken Exchange on Education Technology, 1999).

New teachers often struggle in building student-centered environments with technology in their own classroom after graduation because they do not know how to merge the technology and instruction (Kurz-McDowell, & Hannafin, 2004). Lei (2009), who researched preservice teachers' beliefs, attitudes, and experiences and expertise with technology, reports preservice teachers use technology extensively related to social-communication activities and learning activities as students but lack the knowledge, skills, and experiences to integrate technology into the classroom to help them teach and to help their students learn.

Ertmer (1999) believes education faculty face multiple barriers in their efforts to integrate technology across the preservice curriculum. Ertmer (1999) identified first-order and second-order barriers that prevent effective technology integration in K-12 classrooms. First-order barriers, according to Ertmer (1999), relate to issues of access. Second-order barriers relate to teaching pedagogy, strategy, and skill. While Ertmer's (1999) research focuses on K-12 classrooms, there is no reason to believe that the same barriers are not present in preservice education programs to some degree (Vermillion, Young, & Hannafin, 2007). If teachers can practice using technology in the classroom, they may be more likely to overcome barriers when using technology in their own classroom (Gronseth et al., 2010).

Teachers' use of technology for classroom instruction can make significant differences in improving perceived student outcomes (Grunwald and Associates, 2010). Research has shown that the effective use of technology in the classroom can provide motivation, relevance, and a deeper understanding of information for students (Johnston & Cooley, 2001), reduce anxiety and promote confidence (Ertner, 2005), and foster an effective, constructivist learning environment

(Seo, Templeton, & Pellegrino, 2008). When teachers do not effectively integrate all aspects of technology in the educational process, students miss out on authentic learning experiences emphasizing collaboration, creativity, and innovation. This leads to students who are unprepared to be productive digital-age citizens in a highly competitive digital workplace (Beglau, et al., 2011).

A powerful approach to integrate technology into the teaching and learning process is with multimedia productions (Seo, Templeton, & Pellegrino, 2008). Multimedia, according to Mayer (2008), involves learning from words and pictures. The words can be printed or spoken text. The pictures can be in static form, such as illustrations, photos, diagrams, charts, or maps, or dynamic form, such as animation or video. Multimedia can provide opportunities for students to demonstrate their learning in more authentic ways (Seo, Templeton, & Pellegrino, 2008) and has the potential of promoting meaningful learning (Moreno & Valdez, 2005).

Purpose

The purpose of this exploratory study was to investigate multimedia learning (Mayer, 2001) among teacher education students who developed multimedia movies as final projects in an undergraduate language acquisition course and an undergraduate secondary pedagogy course. The following two questions frame this study.

1. What are the benefits of using student-generated multimedia instruction with teacher education students?
2. What are the challenges of using student-generated multimedia instruction with teacher education students?

Theoretical framework

Mayer's (2001) cognitive theory of multimedia learning guided this study. According to Mayer's (2001) cognitive theory, the learner possesses and uses a variety of cognitive processes to make sense out of presented information (Moreno & Valdez, 2005). The cognitive processes that lead to meaningful learning includes three assumptions about how people learn words and pictures. They include the dual channel assumption, the limited channel assumption, and the active processing assumption. The dual channel assumption states there are two separate channels (auditory and visual) for processing, representing, and manipulating information and knowledge. Researchers argue that teaching students about causal system in both verbal and non-verbal codes results in stronger encoding than with verbal or nonverbal codes alone (Moreno & Valdez, 2005). The limited channel assumption states each channel has a limited, finite capacity for holding and manipulating knowledge. Overload occurs when too many pictures or too many words presented at one time. When this occurs the processing demands required by interactive multimedia may exceed the processing capacity of the cognitive system and prevent learning from occurring (Mayer & Moreno, 2003). The active processing assumption states meaningful learning occurs when learners are engaged in active processing within the channels, organizing them into coherent pictorial and verbal models, and integrating them with each other and prior knowledge (Mayer 2001). Researchers argue that learning increases when students are asked to generate their own context of meaning by self-organizing the materials (Moreno & Valdez, 2005).

Based on the three assumptions on how people learn words and pictures, Mayer (2001) proposed seven principles for the design of multimedia instruction. Mayer's (2001) cognitive theory of multimedia instruction has practical applications and is based on many research

findings that specifically investigated multimedia learning (Reed, 2006). Mitchell (2003) argues that Mayer's (2001) principles of multimedia design could be collapsed into six key categories: integration, parsimony, narration, individual differences, personalization, and interactivity. *Integration* suggests that audio/text need to be highly integrated with the images used. *Parsimony* suggests that students learn more deeply from multimedia presentations when extraneous words, sounds, video, and pictures are excluded. *Narration* suggests that students learn more deeply from narration than from on-screen text. *Individual differences* suggest that learning is better if the target audience has low prior knowledge of the content (intended for novices) and they have high spatial ability. *Personalization* suggests that students learn more deeply when words to the narration are presented in conversational style and include personal comments. *Interactivity* suggests that students learn more deeply when they can control the presentation rate of multimedia explanations than when they cannot.

Method

Participants

During the fall 2010 and fall 2011 semesters, 78 undergraduate, teacher education students enrolled at a small, urban college in the southwest United States participated in this study, of whom 55 were female and 23 were male. The median age of students was 23.2. Students were enrolled in either *Language Acquisition and Learning* or *Secondary Pedagogy*. Both courses require students to observe a classroom teacher from the school district. Students observed teachers using Smartboards, projectors, Elmos, PowerPoint, and videos in the classroom. *Language Acquisition and Learning* is a required course for both elementary and

secondary education majors. I taught both courses concurrently during the fall 2010 and fall 2011 semesters.

Students enrolled in both courses each semester indicated that they use the computer for social media purposes, to browse the internet, to study online, and use Word or PowerPoint at work and school. Six students used movie maker software prior to the study, mainly to organize personal and family photographs. No students completed a similar class project prior to this study.

Data collection and analysis

Data were collected from a questionnaire on students' experiences with multimedia, classroom observations, informal discussions, and students' final movies. The questionnaire asked the following questions and was administered at the end of the semester: 1. What were the benefits or things you liked the most about this project? 2. What did you find challenging or dislike about this project? 3. After completing this project, how comfortable are you integrating technology into the curriculum (uncomfortable, somewhat comfortable, comfortable, very comfortable)? 4. After completing this project, how knowledgeable are you on your selected content (not knowledgeable, somewhat knowledgeable, knowledgeable, very knowledgeable)?

The framework for the content analysis of the qualitative data was based on the design principles from Mayer's (2001) cognitive theory of multimedia learning. Data were analyzed using constant-comparative methodology (Bogdan & Biklen, 1998) and aligned with six key themes of Mayer's (2001) cognitive theory of multimedia learning: *integration, parsimony, narration, personalization, individual differences*, and *interactivity* (Mitchell, 2003). Quantitative data were analyzed by tabulating responses and calculating percentages.

Procedure

Students enrolled in both courses met once a week for an hour and a half and actively studied theory, models, hypotheses, and teaching and learning strategies. The final assignment in both courses was to create a four to five minute multimedia movie on a selected topic studied in class. Criteria for the final project included: an audio recording; images, text, or graphics; evidence of critical thinking and reflection; completion of the project in iMovie or Windows Live Movie Maker; and posting the final project to YouTube. YouTube was selected because it provides easy access to movies. YouTube movies were posted as "unlisted" and were not available publically on the Internet. The use of video in the movie was optional.

Students were required to include information from the course textbooks and two additional resources in their final projects. I showed students how to locate research in educational databases such as ERIC and Education Full Text. All project topics were submitted to me by email for consideration. Students were not expected to purchase software or hardware to complete the project. All courses met in an electronic classroom on campus with access to the Internet, Windows Live Movie Maker, microphones, webcams, and Flip cameras. Students had the option to complete the final project using iMovie. Students were aware, however, that the college did not have Apple computers on campus.

I conducted two technology lessons during the first two weeks of the semester. I taught students Windows Live Movie Maker, how to import video from a web camera or Flip camera, and assisted students to create YouTube accounts. I also shared movies created by former students and movies I created for classroom instruction. Students experimented with the technology in class and created mock movies on a topic of their choice. The "lab" classes

allowed students to practice the technology skills and troubleshoot problems and concerns with me and their colleagues before they "jumped" into the project.

All students were required to create a draft copy of their project and submit it to me at the mid-semester for a grade and feedback. Students were assigned a partner and required to provide each other with feedback on their draft projects. Students and I discussed characteristics of providing quality feedback before they reviewed each other's mid-semester projects. Final projects were required to show evidence of critical thinking of the information gathered from the textbook and additional resources. On the last day of the semester, all movies played on multiple computers in the college's Teaching and Learning Media Center. Students interacted and viewed each other's projects.

Results

Data from this study fit into six themes from Mayer's (2001) cognitive theory of multimedia learning: *integration, parsimony, narration, personalization, individual differences, and interactivity* (Mitchell, 2003). These themes will be presented in this section as they relate to the benefits and challenges of using student-generated multimedia instruction with teacher education students.

Integration

Students agreed the benefit of using student-generated multimedia instruction provided not only the flexibility of choosing a topic but also the flexibility of presenting the topic. The majority of students agreed the integration of multimedia in their final projects was unique, meaningful, and fun. It allowed them to think outside the box and be creative with audio, text, images, and video. One student noted, "The versatility of the project allowed me to stretch my creative wings." Another student commented, "Not many teachers allow us to complete this kind

of project. I was excited to see how it turned out in the end." Several students commented on the value of recording audio and integrating it into a movie with text and stated they prefer multimedia projects over traditional exams or research papers.

A major challenge for students was time. Many students stated it was time consuming to research content, write a script, record audio or video, locate or design images to accompany the audio or video, and integrate all multimedia into a final product. Most students, however, felt rewarded in the end with their finished products. One student noted that time consumption is expected with these types of projects. "It takes time and practice to master the technology," he or she stated.

Students noted that failed technology was one of the major challenges with the integration of multimedia in their projects but, interestingly, demonstrated persistence in troubleshooting the problems on their own. One student explained, "I ran into problems at the beginning with the technology and thought making my movie would be difficult but I worked though the problems and in the end I felt proud and a sense of accomplishment with my movie." The feeling of frustration when technology failed and the feeling of pride and ownership with the finished product were echoed by several students. Another student explained, "I am very basic in technology and found I was constantly frustrated when the technology did not work. However, it is hard to be negative about using technology. I want to be distinguished in using it [technology]." A few students were unable to upload their movies to YouTube because their files were too large, the files were not saved or exported properly, or the website was down for maintenance.

Students agreed it was overwhelming to hear the course expectations and learn new software during the first weeks of the semester without a selected topic in mind. Students agreed

they would have preferred the technology lessons after they read a few chapters from the textbook and were familiar with course-related topics. This would have helped them apply their newly acquired skills and reduce the initial anxiety of the assignment.

Responses to the question on integrating technology into the curriculum administered at the end of the semester revealed 37 students (47.44%) were very comfortable integrating technology into the curriculum, 28 students (35.90%) were comfortable integrating technology into the curriculum, 12 students (15.38%) were somewhat comfortable integrating technology into the curriculum, and 1 student (1.28%) indicated he or she was uncomfortable integrating technology into the curriculum after completing this project.

Parsimony

Mitchell (2003) writes the quality and effectiveness of student products could be largely explained by parsimony. Most students selected stock images or clipart from the Internet to include in their movies. One student, for example, selected reader's theater for her project and included several images from the Internet of students performing in the classroom. Several students used images unnecessarily or as "fillers" (Mitchell, 2003) with no connection to their content. Although the use of video was not a requirement of the project, a few students used Flip cameras to record themselves and interview principals and students. Others photographed their own images and used movie and audio clips from blockbuster movies. One student selected the jigsaw teaching strategy for his project and assembled a jigsaw puzzle in his movie as he narrated the text. Another student discussed constructivism in her project and inserted video clips of students working in a science lab and used animations. Similarly, a student, who researched critical pedagogy, chose to compare her research to a marching band and inserted video clips of a marching band while she narrated her text. Another student decided to approach her project on

classroom management from a journalistic perspective. She designed her project as if she were a news anchor reporting the news. She included music, graphics, text, and video interviews with students as one would see on the evening news.

Overall, a major benefit of using multimedia in this study was a greater understanding of selected content. One student said, "This project required me to be a problem solver and critical thinker. It made me process and apply the knowledge I obtained from my project as a whole rather than in parts." Another student stated, "I dove head first into my topic and truly discovered first-hand what I was presenting. The project required me to be submersed in information and grasp a deeper understanding of the content." "I feel that if someone were to approach me with questions about my topic, I would be able to answer them thoroughly and even engage them in a discussion," said another student.

Responses to the question on knowledge levels of selected content administered at the end of the semester revealed 44 students (56.41%) were knowledgeable on their selected content, 31 students (39.74%) were very knowledgeable on their selected content, 3 students (3.85%) were somewhat knowledgeable on their selected content, and no students indicated they were not knowledgeable on their selected content.

Students noted it was challenging to keep the final project within the required time limit. Several students preferred to expand on their ideas and felt restricted with the four to five minute limit imposed on them. One student commented, "I wish we could have made our movies longer because I had a lot of information to share and more to say." Data also reveal that several students were their own worse critics. A student stated, "I wish my movie could have been more creative. I found that no matter what I did, it was still boring." Another student stated, "This project took me about nine hours to complete because I wanted it to be perfect, yet I feel like it

was still inadequate." A third student wrote, "I like all of my information in my project. I just wish that it was more exciting."

Others considered their projects as experimental or "trial and error" runs for the next time they create similar projects. One student stated, "I think it would be enjoyable to do the project again now that I am familiar with my content and technology." Another student said, "The movie is informative but basic. I wish I used more creative ideas." Another student noted, I was able to focus on the nuts and bolts of my topic and was able to get a good grip on it. The next time I complete a project like this I would like to get more creative and exciting.

Narration

All students were required to use original audio recordings in their final project and successfully completed their narrations. A few narrations were not recorded with optimal settings and contained background noise or static. A few students stated it was challenging for them to listen to their own voice. One student stated, "It was difficult and intimidating to hear myself speak. It was also intimidating to know that my peers would be listening to my work." Others commented on rerecording their audio several times because they spoke too fast or stumbled over the words. Students agreed their narrations contributed to a greater understanding and increased engagement with their selected content.

Although adding music in the background of the audio was not a requirement of the project, several students inserted music with their audio file. One student, who decided to use music in his final project, said "it was challenging to find a song long enough to play in the background of my audio."

Personalization

The term personalization is used to refer to narration that is conversational, personable, and contains the first-or second-person rather than the third-person (Mayer, 2001). Only half of the students' projects contained some degree of personalization. Since the majority of students had little, if any, teaching experience, a challenge for many students was making personal connections from their selected content to practice. Those students who personalized their narration did so with intended application and stated how their new-founded knowledge and skills would assist them in the future as classroom teachers. One student selected a topic, the No Child Left Behind Act, on a whim and through his or her research realized how important and personal the topic was. The student stated, "At the beginning, I just chose this topic because someone said it in class but as I researched it I realized how important and personal it was. The history of the NCLB Act was the most interesting." A few students were substitute teachers and made personal connections to their experiences in the classroom as substitutes.

A few students disclosed they were English language learners (ELL) and made connections from their selected movie content to their own personal experiences as ELL. A student commented, "After researching my topic, I realized I was reading about the same system [dual language program] I was in when I was younger. This helped me make connections and personalize my movie." Another student shared, "By researching sheltered instruction, it gave me a chance to put the different steps in my own words and provide personal examples from my own experiences so I can remember the steps and use them in my future lessons."

Individual differences

Students were informed that their target audience was each other, fellow colleagues in class, and should assume they are novices with low, if any, prior knowledge on the topics. All

projects were created for a novice to use. One student shared his or her movie with several individuals before it was due to be certain the content was concise and understood. He or she wrote:

> I had to make sure people understood what I was trying to say so I asked different people to review my project even if I didn't want them to. I felt it was important to get feedback because of different learning styles. This pushed to me to learn more because I wanted to make sure all students could understand my content.

Mayer (2001) writes that the target audience benefitting the most from multimedia would be those with high spatial ability. Spatial ability is generally defined as the ability to generate, maintain, and manipulate mental visual images (Carroll, 1993). Mayer (2001) argues that conventional instructional messages are heavily verbal, but multimedia messages are verbal and visual, so multimedia learners need to be able to form, hold, and use mental images. No students used spatial abilities in their projects.

Interactivity

All projects were created either in iMovie or Windows Live Movie Maker and uploaded to YouTube. The Internet address generated by YouTube was shared with me and other students. All YouTube movies opened in a web browser with control features such as play, pause, and stop. The control features allowed the viewer to control the pace of the presentation. Internet addresses of the final projects were bookmarked by students and saved for multiple viewings.

Discussion

This study examined the use of multimedia among teacher education students, including the benefits and challenges of using student-generated multimedia instruction in the curriculum. Students overwhelmingly agreed that the use of multimedia to complete their course assignment was fun, engaging, authentic, and provided opportunities to express themselves creatively. Students agreed the use of multimedia instruction allowed them to obtain a sense of

accomplishment, pride, and ownership of their final projects. Students reported being knowledgeable and having a greater understanding of their selected content and felt comfortable integrating technology into the curriculum after completing their multimedia project. These findings support previous research on the use of multimedia projects in classrooms that assist learning, contribute to higher levels of student engagement, a deeper understanding of course content, and serve as a good pedagogical strategy to encourage leaners to think critically about academic content (Dunsworth & Atkinson, 2007; Mayer, 1997; Mitchell, 2003; Seo, Templeton, & Pellegrino, 2008).

Challenges surfaced as students used multimedia instruction in the curriculum. Students noted it was challenging to complete multiple components of the project at once, such as researching content, selecting or developing images and/or text, recording audio and/or video, and uploading the final project to the Internet. Similar projects in the future should provide ample time for students to research and gather information on their content before they learn related technology and then provide ample time for students to select or develop images, text, or graphics. Additionally, multimedia manuals or tutorials should be posted to an online website or discussion board for students to read and view. Open labs should also be available to students throughout the semester where they can drop by and meet with the instructor to discuss technical or theoretical concerns and questions. These suggestions may help reduce some of the challenges identified in this study and reduce students' concerns about being overwhelmed with multimedia.

Students also noted that failed technology such as software or website glitches contributed to high levels of anxiety and frustration. This finding is consistent with researchers who identified technical difficulties as main hindrances to multimedia projects (Seo, Templeton, & Pellegrino, 2008). Additionally, students wished their projects could exceed the four to five

minute time requirement. It is unclear whether allowing students to exceed the time requirement would have distracted them from producing parsimonious projects or if the added time would have contributed to a greater understanding of their selected content.

Data from this study reveal that students had a difficult time making personal connections from the course content to practice. A lack of teaching experience by the majority of students at the time of this study may have contributed to this finding. Mitchell (2003) argues that Mayer's (2001) principle on personalization should allow individuals to create emotional connections with the viewer. Mitchell's suggestion may provide additional options for students who struggle to include personal comments in their multimedia and may allow them to present information beyond the first or second-person voice.

It is interesting to note that a selected group of students routinely checked the number of views their movies received online and competed with each other for the highest number of views. Since the movie was posted to YouTube as an unlisted movie, I can assume they shared their movies links with each other, family, and friends before the final project was due. It is unknown what effect, if any, this friendly competition had on obtaining new knowledge on topics selected by other students. It is also unknown what effect the display of final projects at the end of the course had on students' understanding of topics selected by other students. Similar projects should include an assessment tool, beyond the mid-semester peer evaluation, that allows students to demonstrate their understanding of content from other completed projects.

The finding that students viewed their projects as experimental or "trial and error" runs for similar projects created in the future suggests that students may challenge themselves more once the novel effect of using multimedia has worn off and the appropriate skills have been obtained. This can be viewed as a benefit and challenge of this study. Practicing technology is

important for preservice teachers; however, technology skills alone cannot guarantee the effective use of technology in the classroom (Ertmer et al., 2005). To help preservice teachers integrate technology into teaching in meaningful ways, teacher education programs need to help preservice teachers understand how technology connects with content and pedagogy (Lei, 2009).

As stated earlier, students were required to observe a classroom teacher as part of the course requirement. School placements for student observations were random and arranged by the school district. It is unknown if the classroom teachers used technology as best practices with strong connections to academic content and whether or not classroom observations influenced students' multimedia projects. This information was not collected in this study. Further research is needed in this area.

Researchers argue preservice teachers need to observe and use technology in authentic K-12 school contexts (Barab, Squire, & Dueber; 2000). Whether the teaching of technology occurs through didactic lectures or open-ended projects, if the learning occurs exclusively in the university context there will continue to be a gap between school learning and real-world application (Barab & Landa, 1997). It is recommended that teacher preparation programs identify professional development schools or partnership schools that effectively use technology in the classroom and place their preservice teachers at those schools to complete observation hours and student teaching internships and practicums. Dawson and Nonis (2000) found that school-university collaborations produce positive attitudes toward the integration of technology into the classroom, increased skills and knowledge of educational technologies, confidence in technological abilities, content specific uses of technology, and classroom management issues related to educational technologies. Other researchers recommend the idea of *Learning by Design*, whereby teachers learn about educational technology by engaging in authentic tasks in

small collaborative groups (Koehler & Mishra, 2005). Further research in this area will assist teacher educators' understand and identify ways to integration technology in a meaningful and successful manner.

Conclusion

Teachers have a vital role to play at the intersection of technology and 21st century skills—modeling their confidence with technology, guiding young minds toward constructive educational purposes, and teaching students new skills for a competitive, global world (Grunwald and Associates, 2010). Teacher preparation programs are expected to embrace and support this role. This article provides an example on how teacher educators can integrate multimedia in their programs and has promising implications for other teacher educators interested in replicating similar projects. The results of this study have initiated a dialogue within my own school of education on the role of technology throughout our teacher preparation program, including the role of technology in student teaching and the delivery of student teacher portfolios. Initial and ongoing exposure to multimedia in teacher preparation programs has the potential to enhance preservice teachers' confidence and competence with technology and increase student engagement. Students of this study agree that the benefits of using student-generated multimedia instruction outweigh the challenges.

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