Innovate: Journal of Online Education

Volume 2
Issue 6 *August/September 2006*

Article 3

9-1-2006

Using Tablet Technology and Recording Software to Enhance Pedagogy

David J. Radosevich

Patricia Kahn

Using Tablet Technology and Recording Software to Enhance Pedagogy

Using Tablet Technology and Recording Software to Enhance Pedagogy

by David Radosevich and Patricia Kahn

The National Center for Education Statistics for the 2000-2001 academic year indicates that 56% of all two and four year degree-granting institutions already offer distance education courses and an additional 12% plan to start offering such courses in the following three years (Waits and Lewis 2003). This drive for increased e-learning enrollment has evolved with the changing student culture of higher educational institutions. According to Jones and Madden (2002), typical college students have grown up with computers, and the Internet has become an essential ingredient to their everyday lives. In response to such changes, institutions of higher education have incorporated new teaching styles and altered their business strategies of delivering courses to meet the demands of 21st-century learners (Beaudoin 2003).

In one respect, increasing e-learning enrollment encourages educators to design constructivist-based courses that support technologically savvy students. The framework of these newly designed courses promotes student learning through active engagement, resulting in knowledge produced from experience as opposed to the passive receiving of knowledge typical of the traditionally styled lecture (McGriff 2001). Recent research shows that technology properly deployed in the classroom can enhance the learning process by making it more interactive and enjoyable while also allowing for curriculum customization to match learners' developmental needs as well as personal interests (Valdez et al. 2004). However, teachers often face the problem of finding instructional technologies suited to 21st-century learners that do not require a high level of technical proficiency. Instructors eager to incorporate group collaboration in their pedagogy seek a low-threshold technology that promotes a constructivist approach to teaching and learning while also customizing the curriculum to the learner.

At Montclair State University, a solution to this problem was sought in tablet technology and recording/playback software. In the following case study, we assess the integration of these tools in three different courses in order to determine whether their use makes a significant difference in student learning.

Technology and Learning

Why should educators look for technological solutions to the problems of student motivation and engagement when external accreditation boards (Higher Learning Commission 2003) and student and faculty surveys already validate traditional face-to-face learning environments? One review of studies that examine whether distance education is worse, better, or as good as traditional education has already shown no significant difference between the two environments (Russell 1999). Though Russell had hoped to find scientific backing for his initial hunch that distance education is superior to traditional methods, his research concluded that the two learning environments are almost equal. Reviewing this and other research, theorists conclude that technology does not influence learning; rather, it is an instructor's pedagogical method that engages students and provides a quality education in online environments (Durrington and Yu 2004; Valdez et al. 2004).

Although pedagogical method is indeed crucial, it would be premature to cite Russell's review and discount the significant role technology can play as a positive catalyst for enhanced learning. At a recent NJEDge.Net Symposium, for example, several instructors addressed both positive and negative consequences from online learning environments whereas students communicated only favorable outcomes and did not express any disappointments about their learning experience in this medium. This overwhelmingly positive student response may only reflect nonlearning outcomes such as satisfaction with the flexibility that online courses offer (Brooks 2003), but we found this response significant enough to warrant further investigation into the possibility that technology has a meaningful impact on the learning process despite Russell's findings.

Furthermore, we wanted to explore whether technology may better facilitate constructivist pedagogies so crucial to promoting student motivation and engagement.

More recent research describes how technology can be utilized to address student learning styles. This research has shown that technology can be especially useful when introducing complex subject matter and when requiring learners to use both visual and auditory mechanisms in order to process new information. For example, Valdez et al. (2004) describe dramatic improvement in retention when multimedia and graphics, modes that allow learners to hear and see the content, are integrated into the curriculum. Clark (2003) and Simons (2004) have also shown that students' comprehension of material increases significantly when multimedia facilitates learning objectives. These studies suggest that "technology may transform the educational content and motivate students toward lifelong learning" (Valdez et al. 2004, ¶ 3).

Further studies have indicated more specific ways in which technology can be used to support collaborative and interactive learning activities consistent with constructivist principles. For example, McLaughlan and Kirkpatrick (2004) built technology-assisted activities that enabled students from different disciplines to participate in role-play simulations to investigate and resolve economic issues in Southeast Asia. This level of collaboration would be difficult to orchestrate without the use of technologies that coordinate and connect diverse participants. Additionally, Ingram, Thompson, and Tcha (2001) describe an online economics class where students were introduced to difficult concepts through a combination of interactive graphs and textual representations. In order to help novice learners understand complex economic relationships, the graphs were designed with interactive buttons, color-coded segments, and animated portions that allowed students to reconstruct the graphs sequentially and thereby build on prior information in the process. Such a construction "requires the flexibility, on the part of the learner, to move between levels and to develop an understanding of the interrelationships between the different levels" (285). Such interactive tools place learners in control of their own learning because the decision to move to the next level—or layer—depends on each learner's comprehension of material.

While research indicates that technological integration can benefit learners, research regarding the effects on learning outcomes from the use of recording/playback software in conjunction with tablet technology has not been conducted. However, the pedagogical strategies addressed in the aforementioned studies provide suggestive analogs for how these technological tools may be used similarly to sustain engaged student learning. Our study therefore explored pedagogical strategies for using recording/playback software and tablet technology whereby students demonstrated their knowledge by applying real-life examples to course concepts, offering and receiving feedback on a class project, and revising their work in response to such feedback. The study essentially sought to answer one key question: Does integrating recording/playback software and tablet technology into an instructor's pedagogy make a difference in student learning?

The Study

We tested our research question at Montclair State University by using Hewlett-Packard tablet technology and Lecture123 recording/playback software. This study was designed to compare the effectiveness of the technology on student learning in three different classes: Personality Psychology, Organizational Behavior, and Human Resource Management. One professor taught all three classes in the spring and fall semesters of 2005. The three classes from the first semester did not receive the technology (hereafter called the "non-technology" group); the three classes of the second semester received the instructional technology (hereafter called the "technology" group). Comparisons were made between the non-technology and the technology groups across each of the three classes.

In terms of its specific capabilities, the technology in this study enabled students in the technology group to use both visual and auditory mechanisms to process detailed instruction. The Lecture123 software allowed students to record the audio content of class lectures as well as the PowerPoint slides that accompanied the lectures directly onto their own computers, and the tablet technology allowed students to mark, annotate, and post questions to the slides and save these changes for subsequent discussion. (Click here to see a video

demo of the technology.) Moreover, the hardware and software technology also allowed students to create their own presentations; students were thus able to use the technology to work on projects and problem-solving activities outside of class and to receive focused feedback from the instructor or their peers (Figure 1). By using tablets and recording/playback software, students had the opportunity to take charge of their learning by recording their notes and demonstrating their results to the class.

By affording opportunities for collaboration and peer review, the technology helped reinforce a constructivist approach to learning; the instructor further supported such an approach by placing students into groups that were assigned to review case studies related to the subject matter of the course. Although the content of the case studies was different from one class to the next, similar variants of the group project were assigned to all three classes. In their projects, students used the tablets and recording software to provide various scenarios related to the case study, to record their discussions and written explanations, and to share this information with other learners in the discussion forum of the Blackboard management system. In turn, their peers provided questions and feedback that further enhanced the collaborative learning experience (Figure 2). Thus the students used the technology for more than just taking notes in class; they also used it to assume greater responsibility for their learning by writing and recording their input for others to review.

Furthermore, by uploading their recordings as discussion posts in Blackboard, students in the technology group were able to benefit from the technology throughout the remainder of the course. Students described their problem-solving methods, which were then evaluated in a discussion thread by their peers for further information processing. The ability of students to ask questions at specific points within any presentation enhanced collaboration, and answers could be integrated back into the presentation for everyone's benefit (Figure 3). Finally, the repository of questions and answers also provided the instructor with the ability to note the questions that appeared most frequently and adjust future lessons accordingly (Figure 4).

The manner in which technology was integrated in the classes using tablets and recording software group distinguished them from the non-technology classes; otherwise, the instructor held everything constant that was in his control. The students received the same lectures, viewed the same PowerPoint slides, took the same tests, and had the same projects in each respective class across both semesters. Moreover, the instructor ensured that the constructivist strategies employed in this study were as similar as possible for both groups. For example, students in the first-semester (non-technology) courses were provided extra time in class for group discussion and peer feedback regarding their case study projects as opposed to the use of the discussion forum by students in the technology courses; students in the non-technology courses were also encouraged to solicit further feedback from their peers and instructor outside of class. Finally, there were no meaningful statistical differences between students' SAT scores, prior GPA, and age, suggesting that students in the non-technology and technology groups were comparable in ability at the onset of the semester. These findings allowed us to make a stronger inference that any differences in learning were a result of the technology as opposed to differences in ability of the students. Figure 5 provides a detailed comparison of student demographics in each class.

It was our hope that the manner in which the technology was implemented in the technology classes would be consistent with past research supporting the use of technology to empower students and enhance the quality of learning. Specifically, the strategies employed in all three classes reinforced these opportunities by providing a medium for students to collect both peer and instructor information, to cultivate their critical thinking skills, and to form relationships with previously learned content in a manner other than traditional note taking.

Results

Through a mixed methods approach, an evaluator can employ triangulation by collecting both quantitative and qualitative data at different stages of inquiry, which in turn can yield more decisive findings (Sharp and Frechtling 1997; Creswell 2001; Bebell, Russell, and O'Dwyer 2004); this approach may reveal discrepancies in the analysis or data collection and help the researcher blend the findings from both strategies into a

workable solution (Johnson and Onwuegbuzie 2004). We used such a mixed methods approach in our measurement of the results in this study.

Quantitative Evidence

The first class examined was Personality Psychology, where the final class average was 83.00 without the technology. In the following semester when the technology was employed, students' final class average increased slightly to 84.13, a statistically insignificant result. In contrast, statistically meaningful results were found in the other two classes. Specifically, students in Organizational Behavior earned a class average of 79.34 without the technology while the following semester's class earned an average grade of 83.94 with the technology. Students enrolled in Human Resource Management earned a class average of 72.73 without the technology, but the following semester's class improved dramatically by earning a class average of 82.52 with the technology (Figure 6).

Additional quantitative evidence was provided that focused on student motivation to use the technology and their satisfaction with the technology. Each student responded to three key motivational concepts using a seven-point scale (1 = strongly disagree; 7 = strongly agree) (Figure 7). The first motivational variable focused on students' expectancy beliefs that they would be able to put forth the effort and successfully use the technology. Across all three classes, students reported high expectancy beliefs (mean = 6.03). The second key motivational variable addressed how instrumental students believed the technology would be in helping them meet their class grade goal. On average, students indicated high instrumentality beliefs (mean = 5.37) regarding the technology's ability to help them attain their grade goal. The final key motivational variable was student satisfaction with the technology as a teaching tool for them personally. Students indicated very high levels of satisfaction (mean = 6.02).

Qualitative Evidence

At the end of the semester, both the technology and non-technology classes were afforded the opportunity to provide anonymous feedback regarding the learning process as an attachment to their evaluations of the instructor. Student survey results described how the use of this technology "eliminated the need of constant writing and note taking in the classroom." Students appreciated the ability to ask the professor questions via e-mail within the playback lecture and then review the professor's answer to that question at the exact point of the lecture where the question was raised. Because the software allowed for every question and answer to be posted within the lecture for the entire class to review, students regarded the technology as a genuine asset to their learning experience in the course. Overall, the benefits cited most frequently in the anonymous student feedback included less class time spent going over the same questions, focused feedback in response to questions about particular points in the lectures, and more time allowed in class to cover additional material.

A few students' comments summarized their experience well. One student commented,

As a returning student, I cannot tell you how helpful the recording software has been. I have used the tool to review lessons, assist me in homework questions, and prepare for exams. Additionally, I found the tool to be a great compliment to Blackboard's functionality. For a student like myself who holds a demanding full-time job, this new technology at MSU has allowed me to keep up with the pace of the class.

Another student commented,

I have ADHD, so I miss part of some lectures when I am unable to concentrate for part of the lecture. It is a very big relief for the first time in my life to know that the material I missed is available at my fingertips for review, to fill in the gaps from class. I cried when I used this. Thank you!

In sum, the quantitative and qualitative evidence revealed that using tablet technology and recording/playback software resulted in positive feedback and improved learning outcomes. Specifically, the technology had a meaningful impact on student learning in two of the three classes, and it appears that the recording technology had the most impact on students' grades in those classes that were more technical in nature. Across all three classes that employed the technology, students indicated high satisfaction and motivation to use the technology. Results from user surveys also revealed that most users were engaged in the learning process without the need for extensive training in the use of the technology.

Anecdotally, the particular faculty member who taught these classes also reported that class participation was more meaningful in the technology classes because his students were able to ask more substantive follow-up questions after listening to the lecture with the playback software. He further reported that peer-to-peer and peer-to-instructor communications were exchanged more extensively and effectively with the technology, resulting in more effective collaboration and deeper student understanding of the material. Finally, this instructor indicated that the ability to search student questions delivered via the technology was compelling and useful.

Conclusion

Technology has become a staple of the 21st-century learning environment, and as technology changes, so do the opportunities of instructors to empower students to engage in successful learning. As described in past research (Ingram, Thompson, and Tcha 2001; McLaughlan and Kirkpatrick 2004; Valdez et al. 2004), technology can make a positive difference in student learning if it is accompanied by a pedagogy suited to its distinctive advantages. In particular, technology fosters a constructivist learning environment, providing the mechanism for learners to share their experiences, to observe different perspectives, and to generate new meanings and solutions through a shared understanding.

In our research, tablet PCs and recording/narration technology enabled learners to process complex material more easily and motivated them to contribute their findings to other learners more consistently and effectively. Our results demonstrate that integrating effective technology into an instructor's pedagogy can further enhance the learning environment and promote a dynamic, student-centered learning atmosphere where the emphasis is on learning by doing rather than learning by note taking. Additionally, our findings support previous conclusions (Motschnig-Pitrik and Holzinger 2002) that positive outcomes can result as long as the curriculum and the students possess a degree of openness that enable learners to build on prior knowledge and experiences. We hope that future research will further examine how recording/narration software and tablet technology—as well as other emergent technologies suited for constructivist learning activities—affect learning outcomes by offering students the opportunity to take greater control over the learning process.

References

Beaudoin, M. F. 2003. Distance education leadership for the new century. *Online Journal of Distance Learning Administration* 6 (2). http://www.westga.edu/~distance/ojdla/summer62/beaudoin62.html (accessed July 3, 2006).

Bebell, D., M. Russell, and L. O'Dwyer. 2004. Measuring teachers technology uses: Why multiple-measures are more revealing. *Journal of Research on Technology in Education* 37 (1): 45-63. http://escholarship.bc.edu/cgi/viewcontent.cgi?article=1025&context=intasc (accessed July 3, 2006).

Brooks, L. 2003. How the attitudes of instructors, students, course administrators, and course designers affect the quality of an online learning environment. *Online Journal of Distance Learning Administration* 6 (4). http://www.westga.edu/~distance/ojdla/winter64/brooks64.htm (accessed July 3, 2006).

Clark, R. 2003. *Building expertise: Cognitive methods for training and performance improvement*. 2nd ed.

Silver Spring, MD: International Society for Performance Improvement.

Creswell, J. 2001. *Research design: Qualitative, quantitative, and mixed methods*. Thousand Oaks, CA: Sage Publications.

Durrington, V. A. and C. Yu. 2004. It's the same only different: The effect the discussion moderator has on student participation in online class discussions. *Quarterly Review of Distance Learning* 5:89-100.

Higher Learning Commission. 2003. Statement of commitment by the regional accrediting commissions for the evaluation of electronically offered degree and certification programs. http://www.ncahlc.org/index.php?option=com_content&task=view&id=32 (accessed July 3, 2006).

Ingram, D., E. Thompson, and M. Tcha. 2001. The convergence of text and graphics in an online learning environment: A case study in economics. In *Meeting at the crossroads*: *Proceedings of the 18th annual conference of the Australian Society for Computers in Learning in Tertiary Education*, ed. G. Kennedy, M. Keppell, C. McNaught, and T. Petrovic, 281-288. Melbourne: Biomedical Multimedia Unit, The University of Melbourne. http://www.ascilite.org.au/conferences/melbourne01/pdf/papers/ingramd.pdf (accessed July 3, 2006).

Johnson, R., and A. Onwuegbuzie. 2004. Mixed methods research: A research paradigm whose time has come. *Educational Researcher* 33 (7): 14-26. http://aera.net/uploadedFiles/Journals_and_Publications /Journals/Educational_Researcher/ Volume_33_No_7/03ERv33n7_Johnson.pdf (accessed July 3, 2006).

Jones, S., and M. Madden. 2002. *The internet goes to college: How students are living in the future with today's technology*. Washington, DC: Pew Internet and American Life Project. http://www.pewinternet.org/pdfs/PIP_College_Report.pdf (accessed July 3, 2006).

McGriff, S. 2001. ISD knowledge base. http://www.personal.psu.edu/faculty/s/j/sjm256/portfolio/kbase/IDD/ISDModels.html (accessed July 3, 2006).

McLaughlan, R. G., and D. Kirkpatrick. 2004. Online roleplay: Design for active learning. *European Journal of Engineering Education* 29 (4): 477-490.

Motschnig-Pitrik, R., and A. Holzinger. 2002. Student-centered teaching meets new media: Concept and case study. *Educational Technology and Society* 5 (4): 160-172. http://ifets.ieee.org/periodical/vol_4_2002/renate.html (accessed July 3, 2006).

Russell, T. 1999. *No significant difference phenomenon (NSDP)*. Raleigh, NC: North Carolina State University.

Sharp, L., and J. Frechtling. 1997. Introducing this handbook. In *User-friendly handbook for mixed method evaluations*, ed. J. Frechtling and L. Sharp, 9-18. http://www.nsf.gov/pubs/1997/nsf97153/chap_1.htm (accessed July 3, 2006).

Simons, T. 2004. The multimedia paradox. *Presentations* 18 (9): 24. http://www.presentations.com/presentations/search/article_display.jsp?vnu_content_id=1000734183 (accessed July 3, 2006).

Valdez, G., M. McNabb, M. Foertsch, M. Anderson, M. Hawkes, and L. Raack. 2004. *Computer based technology and learning: Evolving uses and expectations*. Naperville, IL: North Central Regional Educational Laboratory. http://www.tc.umn.edu/~mcleod/criticalissues/pdf/valdez.pdf (accessed July 3, 2006).

Waits, T., and L. Lewis. 2003. *Distance education at degree-seeking postsecondary institutions: 2000-2001*.

Washington, DC: National Center for Educational Statistics.
http://nces.ed.gov/surveys/peqis/publications/2003017/ (accessed July 3, 2006).

COPYRIGHT AND CITATION INFORMATION FOR THIS ARTICLE