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Tablet PCs and Engagement in Business Education

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Abstract
In this case study, Tablet PCs were used to support learning in business education courses. Findings indicate that such tools increase classroom interactivity, student learning and engagement, student organizational skills, and student business technology applications. Recommendations for further applications of mobile technologies include student and instructor development and feedback strategies, supportive infrastructure, software, and pedagogy that engage the learner.

Introduction

Students born after 1982 have a preference for visuals over text, random access to resources, constant access to peers, active engagement, and situations that involve strategy and problem solving (Howe, Strauss, Matson, 2000; Grunwald, 2003; Tapscott, 1999). Recent literature describes the 'digital' or 'millennial' student proposes a new teaching methodology that places more control and responsibility with the learner resulting in a richer learning experience (Oblinger, 2003; Brown, 2002; Tapscott, 2005). Given these traits and pervasive access to technology, we find new student preferences and expectations about how information is delivered and how interaction occurs. Moreover, the growing adoption of mobile technologies in educational and business settings is evidence of the shift toward pervasive learning technologies that millennials embrace (Norris, Mason, & LaFrere, 2003; Cross, 2003; Oblinger, 2003; Kemelgor, Johnson, & Srinivasan, 2000).

We employed a case study to examine the impact of a Tablet PC on teaching and learning processes, within business education courses. We discuss the outcomes of the case study, including its impact on course design, instructional outcomes, instructor and learner behaviors and perceptions regarding learning technologies, and recommendations for using technology to enhance business education.

Business Education and Mobile Technologies

The Tablet PC introduces a convergence of technologies that are familiar to students and instructors. Tablet PCs include all of the laptop or notebook functionality as well as the ability for the user to write or draw using a special electronic pen as an input device, replacing the pad and pencil and computer keyboard (Berque, Bonebright, & Whitesell, 2004). For instructors, the Tablet PC consolidates the functionality of a whiteboard, computer, and document camera device and can be used to write and easily display a process, diagram, or illustration. Tablet software also enables instant polling and collaboration in class, thus replacing previously separate tools and functionalities, such as student input devices or clickers. Tablets can be used as a pedagogical strategy for instructor-guided learning that can shift to truly learner-centered through spontaneous, self-directed activities, while remaining adaptive to the needs of the learner. Cole (2003) continued use of this tool in higher education and business because of productivity-enhancing applications (such as databases and spreadsheets), decreasing costs, software interoperability, and increased portability.

Because business education strives to engage students in becoming critical thinkers and problem-solvers, its curriculum is poised to take advantage of mobile technologies. Interactive technology allows for new ways to engage students, provides ways to support teamwork, increase student-student and student-faculty interaction, add additional time-on-task, and increase the rate and quantity of feedback (Scheele, Seitz, Effelsberg, & Wessles, 2004; Bernd & Hampel, 2003). Mobile technology can transform traditional, passive lectures into learning experiences where students engage in expanding and deepening learning, where problem-based learning is employed in small or large groups, and where peer and faculty feedback is integrated (Greenwood & Haughian, 2006).

Method

This case study began in 2005 at a business college of a large, public, southwestern university that faced several teaching and learning issues: instruction in large impersonal classrooms, lack of course/program integration, minimal learner exposure to and application of business technologies, minimal student active engagement in learning, traditional and rigid course delivery methods, and wasted out-of-class time. A case study method was used to examine a Tablet PC pilot that was new to the college. The project intended to enhance students' critical thinking and problem-solving skills by incorporating the use of real world information and data in decision-making processes, ultimately producing better thinkers and future professionals. Tablet PCs were chosen because they enable improved learning and collaboration dynamics from a traditional laptop, especially in team environments, which business colleges emphasize (Villano, 2003; Williams, 2003). The pilot study was used to collect preliminary data, articulate further research questions, and determine specific indicators and measurements of success (Teijlingen & Hundley, 2001).

The project intended 1) to support a group of students and faculty in the use of Tablet PCs; 2) to provide students and faculty members with Tablet PCs and associated technologies; 3) to create relevant learning activities to utilize the mobile technology in and out of the classroom; 4) to provide adequate training for users in the hardware (tablet, presentation devices, wireless technology), associated software (Microsoft Office Suite), and systems for learning

management and developing content; 5) to provide technical support and maintenance; 6) to collect and analyze data and periodically report on progress and measurable results; 7) and to determine next steps.

Goals for faculty members focused on their teaching and organizational behaviors, as well as how they viewed student participation. Faculty members participated in course redesign, which also led to higher expectations of student work. Also, faculty expanded assignments that applied class learning, such as preparing short presentations or conducting research.

The study sample included three faculty members and three departments in the undergraduate business program. Forty-two junior-level students directly participated and approximately four hundred students were exposed through classroom observation and teamwork. Classes included both small classes (less than 40 students) and large lectures (up to 200 students) of the undergraduate business core. The study's faculty members taught in the junior-year courses and redesigned these and other courses to further integrate technology into their curriculum.

Training and Support

An important part of the project was a mandatory orientation at the start of each semester, which was eight hours long and attended by all participating students, faculty members, and support staff. Students and instructors had their Tablet PC during the training so they could practice and apply the demonstrated techniques. Participants learned about tablet functionality, and how to use pen-based technology in various software applications from an instructor and student perspective. Some of the topics covered included Tablet PC capabilities and operations, instructional technology tools (projection devices, videoconferencing, chat, threaded discussion), software integration examples using Microsoft Office (Word, Excel, PowerPoint) and advanced uses of the college's course management system (CMS). Faculty also attended a separate sessions where they developed applications of the tool that were incorporated into their curriculum.

Curriculum Redesign

Courses involved in the case study were redesigned so that students would benefit from a more efficient curriculum and the application of mobile technology in several measurable ways: to eliminate redundancy among courses, to create complimentary cross-course projects, to increase active learning, to increase communication and collaboration among the faculty, to share instructional problems and solutions, to support data-based problem solving, and to work together toward a more effective instructional program. This process required collaboration among participating faculty members as they worked together to map the curriculum's instructional components, break down courses into learning outcomes, and integrate technology into identified course objectives.

Data Collection

The case study used several evaluation methodologies to capture student and faculty experiences using the Tablet PCs and examine the outcomes of curriculum redesign. In order to

capture learner perceptions about and experiences with pen-based tablet technology, redesigned curriculum, and mobile technology, students completed a pre- and post-assessment of their perception of the technology. The post-assessment identified self-reported outcomes at the conclusion of the term determining several areas of interest listed in Table 1. Additionally, two focus groups were conducted with each of the participating classes in the middle and end of each semester to capture students' report on: frequency of use, task-specific usage, most effective uses, transformation of classroom tasks and the learning environment, challenges and obstacles, effect on the educational experience (e.g., taking notes, presenting, researching, organization, and reading), and pen-based uses (e.g., assignment markup, live annotation, note-taking, and drawing). All conversations were recorded and analyzed.

Faculty members' perceptions and behaviors were collected using surveys and focus groups at several points: during the course redesign process, at the technology training, throughout the regular meetings throughout the term, and during the case study report at the conclusion of each term. Key areas of interest were student use and participation during in-class interaction, use of classroom technology, team work using technology, communication with other students using technology, insight into course material via online discussions, familiarity with using technology applications, time spent each week using technology applications, skill level using technology applications, satisfaction with classroom technology, instructor use of technology, benefits of using technology, grades, communication with students and instructors, additional practice and application of course concepts, and time and material management. Faculty responses were recorded and analyzed.

Findings: Students

Our findings of student perceptions showed the most positive results in the areas of classroom engagement, efficiency in preparing assignments, organization benefits, and preparation for the workforce. Eighty-three percent of students agreed that they were more engaged during class when the instructor used some form of technology. Students felt that Tablet PC use improved their technology skills, better prepared them to use and apply technology in future classes and in the workforce. Students reported that their use of technology assisted them in becoming more organized and allowed them to be more efficient in preparing class assignments. Despite the engagement and organizational benefits, only half the students reported that the use of technology had a positive impact on grades. This may have been a result of the application of technology being indirectly focused on learning outcomes in the course redesign. Students were most enthusiastic about the tablet's effect on classroom interaction, overall organizational capacity, enhanced academic experience, and exposure to software applications like Microsoft Excel, as well as easy access to course materials. Students also appreciated being able to download instructor's Power Point presentations so that in preparation for class they could annotate directly on the slides during the lecture, improving their note taking and knowledge management.

Findings: Instructors

Faculty members who taught large classes expected better student performance, higher quality student work, increased student enthusiasm and engagement as a result of the new technology

integration. At the conclusion of the semester, faculty members noted several changes in their own teaching and in student learning. Students reported to them that they were more organized and that they were able to take greater advantage of the CMS with Internet connectivity, both in and out of the classroom, thereby facilitating greater communication with team members and instructors. Faculty members found that using the tablets and wireless projection technology enabled students to make daily in-class presentations, thereby increasing engagement and activity within the large courses.

Faculty who taught in the smaller classes saw shifts in student interactions. For example, during peer editing sessions, traditionally using printed documents, students edited documents in class, using the reviewing function in Microsoft Word and other collaborative pen techniques. After editing, students posted their edited documents to the CMS for viewing and exchange. During in-class research sessions for their projects, students received immediate feedback from the instructor and shared their best sources with the entire class. When teams started building PowerPoint slides in class, the instructor and graduate teaching assistant visited each team and made immediate suggestions for changes that could be instantly incorporated and evaluated. When teams gave presentations, other teams would make notes and critically assess directly onto the team's presentation and then submit that feedback to team members immediately following the presentation via email, a strategy not possible through other technologies.

All instructors reported that students were eager about using tablets in class, and as they discovered the additional functionality, their enthusiasm increased. Also, teams seemed to bond together more quickly because they were communicating more frequently using their tablets. Finally, instructors reported that the students as a whole seemed to work collaboratively with more energy and regularity than other sections, perhaps because they were required to communicate and interact with each other more often.

The constant presence of technology did present some classroom management issues for instructors. During class meetings, about one-fifth of students used the tablets for something unrelated to class, including instant messaging, emailing, and web browsing. Instructors reported that while lecturing, there was frequently an undertone of quiet conversation from students in class, which may have been prompted by the distractions of the activities in which they were engaged. Calling the class to order at the beginning or after a group activity always took three to five times longer than in a regular class.

Pedagogical Applications

From this study's findings, we illustrate the pedagogical value of Tablet PCs and pen-based technologies inside the classroom and in virtual environments in Table 1.

[Insert Table 1 here]

The project was able to support and implement various instructional strategies enabled with technology including problem-based learning, peer-critique, real-time feedback, and active engagement, thereby addressing several previously identified teaching and learning issues

which were difficult, if not impossible, to implement in a traditionally-designed course.

Conclusion

Although this study was formative and data was primarily self-reported, findings indicate that new technologies, such as the Tablet PC, should be considered for adoption into courses with strategic support, careful planning, and faculty involvement in course redesign. Self-reported data can be limiting in its transferability to other learning situations, but in this case users indicate an acceptance and adoption of new technology within a short amount of time, and to the perceived benefit of all involved. Additionally, we found little negative response to the technology, which may be attributed to the training and just-in-time support provided to students and instructors, perhaps resulting in more positive and successful adoption of the technology. Findings also indicate that critical areas for successful implementation include the selection of software, pedagogical designs that focus on feedback, strategic pedagogy for large classes, functional technology infrastructure that supports the tool, and just-in-need support mechanisms.

TABLE 1. Tablet PC Pedagogical Applications		
Within Classroom Environments		
What the faculty member can do	***What the student can do***	***Pedagogical Value***
Project wireless data to describe lessons and review student work.	Use Tablet PC tools, such as OneNote, to annotate work and organize digital notes for each class.	Problem-based learning, real-time feedback.
Give presenting rights to various students for co-presentations.	Use tablet pen to draft and prepare team presentations for final delivery.	Scaffolding, real-time feedback, presentation, performance.
Use tablet pen to mark-up and annotate a URL, student work, or lesson content projected to the class.	Record lectures and synchronize them to faculty member's presentation materials.	Just-in-time instructional modifications.
Note taking on presentations for content updates or student questions.	Use tablet to annotate and take notes on faculty member presentations; search notes as necessary and re-listen to lecture segments to prepare for examinations.	Distributed cognition, real-time feedback.
Use CMS features during class such as chat, threaded discussion, quizzes or tests.	Participate in virtual activities while in class.	Scaffolding, communication, collaboration.
Demonstrate or discuss other free tools that students may use to support their coursework, such as free surveying tools used for market research.	Evaluate and select tools that best support learning style and needs.	Scaffolding, modeling, analysis, evaluation.
Demonstrate tablet features available in various Microsoft Office applications.	Use tablet functions to organize and re-organize information; participate in in-class demonstrations using various software applications.	Modeling, practice, manipulation and organization of data.
Conduct virtual conferencing sessions in class with business leaders to present or discuss a particular topic from the course; demonstrate virtual conferencing functionality to students and recommend free Internet tools for doing so.	Ask questions of presenter; use conferencing for study groups or group projects.	Active engagement, participation, interaction, collaboration.
Implement collaboration software that allows students to view each other's work, annotate instructor's work, and record processes of material instructor is presenting.	Create a poster display using the tablet to draft a storyboard in Windows Journal and then MS Word to finalize; create and use a template to guide team project work, such as report writing or presentation development.	Peer critique, collaboration, editing and revision.
Within Virtual Environments		
What the faculty member can do	***What the student can do***	***Pedagogical Value***
Attach audio messages to student assignments as feedback to individual or teamwork.	Attach audio or written messages to team assignments (Word, Excel, PowerPoint) and pass on to team members for collaborative work.	Multi-modal communication and collaboration, feedback, documented student learning.
Use of learning management system to push assignments and resource data to students.	Use learning management system as central repository for course work; share resources and materials with peers.	Organize and manage course materials.
Transfer or post annotated class notes or files after class; may include student additions to presentation materials.	Make notes or additions to instructor materials.	Time on task, just-in-time support and information.
Develop and create Podcasts, such as interviews with potential product consumers to determine interest and buying decision criteria, or interviews with leaders in various industries.	Review and comment on Podcasts.	Multi-modal communication and use of primary sources for information.
Capture class events electronically and post on learning management system for future viewing.	Review class events anytime and anywhere.	Additional time on course materials.

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