SHORT PAPER ABSTACTS

Monday, October 25, 2010

11:00am – 11:30am

Learning BY numbers: Large scale peer-to-peer learning with Monash MeTL

Nathan Bailey, Katharina Franke, Chris Hagan, David Hagan, and Murray Logan
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Monash University has been exploring tablet-based education since 2008. An integral part has been the use of Classroom Presenter (CP). When both students and instructors have access to Tablet PCs, CP provides opportunities for increased interaction, participation and instant feedback. Our findings indicate that students perceive tablet-based teaching as more engaging and interactive than non-tablet-based classes. However, interaction with CP remains largely focussed on instructor-student feedback, limiting the power of collaboration and peer-based instruction that can significantly enhance engagement and learning. To address this, Monash started to develop its own software, *Monash MeTL*, allowing us to progressively move towards a collaborative approach where students can work together with peers and the instructor in exploring the lecture topic. Currently, *Monash MeTL* incorporates a number of common interactive features, including importing PowerPoint slides for annotation, adding whiteboard space and creating structured quizzes. *MeTL's* full potential is best realised when students take advantage of the shared visual space to collaborate as part of the classroom experience and beyond. Since *MeTL* is server-persistent, students and instructors have access to *MeTL* anytime anywhere, enabling them to collaborate and continue their learning experience beyond the class. In 2010, *MeTL (2.0)* was used in two Medicine cohorts, allowing students to interact with peers during class and to collaboratively construct their understanding of the lecture content. Rigorous testing took place in early 2010 to prepare for the rollout, which indicates that *MeTL* is able to host about 900 simultaneous participants per server.

Reading and Note-taking on Tablets versus Paper: A Comparative Pilot Study

Craig Leonard Brians and Chelsea Aleena Hickey
Virginia Tech, USA

As digital media replace paper for academic reading, students may need to develop new skills to comprehend and retain this digital information. College students typically use computers on a daily basis in their social and educational lives. However, few systematic studies have been performed on the comprehension and retention of digital scholarly information, and the results of the existing research have been equivocal. Some research finds advantages with learning from digital media (Kozma 1991; Chen et al. 2007), paper sources show greater information retention in others (Dillon 1992), while other studies fail to find a difference (Clark 2001; Doolittle and Chambers 2004).

In this study we plan to test a new theory of information retention from digital versus paper sources, focusing on the benefits of pen-based computing. Specifically, this study models the relative advantages

of writing notes on a paper document versus writing notes on a digital document. Additionally, we will control for users' reading preferences.

We expect to find that students who prefer to read on paper more accurately comprehend and retain both digital and paper information. Using the pen-based computing interface to take notes is expected to reduce the retention gap between paper and digital information sources. Although this pilot study will involve fewer than 50 subjects, it should demonstrate the value of pursuing further research on the educational implications of reading digital versus paper media.

Scaling a Grassroots Tablet PC Pilot for Large Scale Campus Integration

Dave Berque, Terri L. Bonebright, and Carol L. Smith
DePauw University, USA

We discuss a strategy for expanding a successful Tablet PC teaching initiative from a small pilot to a more broadly-based campus initiative. DePauw University received Hewlett-Packard Technology for Teaching Grants in 2006 and 2007. The grants supported the redesign of three courses to use in-class group problem solving, collaborative note-taking, and other active-learning activities enabled by the Tablet PCs and DyKnow software. The grant activities included a formal mixed-method assessment that combined (a) a formal experimental study of the impact of Tablet PCs on collaborative problem solving, and (b) an ecologically valid classroom study.

11:45am – 12:15pm

Microsoft Shared OneNote in a 1:1 5th-12th Grade Environment:A Collaboration and Workflow Utopia

Gregory K. Martin, Ph. D.
Cincinnati Country Day School,USA

At Cincinnati Country Day School educators use OneNote in a shared environment, allowing teachers to do more and better formative assessment by having a window into student work anytime and anywhere. Students in courses as far ranging as 5th grade French and Upper School Physics are able to continue to work within the paper notebook paradigm, but with greater multimedia and collaborative capabilities. Students place everything from handwritten notes to audio/video clips in a notebook that can be shared with the classroom teacher and/or other students in the class, thus leading to more effective collaboration. The goal at Cincinnati Country Day was to create a school-wide environment in which the sharing of information was simple, effective, and flexible and enabled both creativity and productivity. OneNote enabled us to do this in several ways. For instance, it enables digital portfolio capabilities like no other form of technology. Clearly applicable in language arts courses, the model can transfer to other disciplines as well. OneNote can also be used as a means of disseminating handouts, worksheets, and writing prompts that students can ink up or type on. Teachers can then navigate through all students' work in a timely and efficient manner.

Patient Problem Posing (3P)

Kevin J. Reins
University of South Dakota, USA

Students often become impatient when they are not readily able to resolve difficult mathematical problems. The author's experimentation with *patient problem posing* in Ubiquitous Presenter (UP) demonstrated positive effects on students' perceptions of problem solving. This technique requires little setup time for an instructor to deploy and can be used as in-class experiences or activities occurring outside of class time, and evokes and encourages students' intuitions and allows opportunities to build a problem and its resolution.

Five steps describe *patient problem posing*: (1) create and upload a PowerPoint slide which poses a significant problem with deep structure to UP, (2) establish an aura of excitement and enable student slide submissions, (3) be *patient* and allow students necessary time for struggle, problem-solving, and entering solutions, (4) critique and review the student submitted slides by syncing with the UP lecture, and (5) help students extract lessons from the UP experience by engaging them in analytic and evaluative reflection.

It was found that this environment allowed students to apply their own frameworks and see connectedness and generalizations within mathematics. Students were better able to evaluate the status of an algorithm or idea, its (a) *intelligibility*, knowing what it means and being able to represent the conception, (b) *plausibility*, believing it to be true and that it is consistent with other conceptions within one's schema, and (c) *fruitfulness*, it achieves something of value and solves an insoluble problem or serves as a powerful means of interpreting other phenomena, while sense making.

Effective Decision Making in the Age of Cloud Computing

Gino Sorcinelli

University of Massachusetts, Amherst, USA

"Effective Decision Making in the Age of Cloud Computing," is a university-based, multi-cultural, Seminar where students at the University of Massachusetts Amherst, the National University of Ireland Galway, and the National University of Ireland Maynooth, use Tablets and Cloud software to achieve the following high-impact learning outcomes: a) collaborating with students locally and overseas; b) distilling information into manageable categories; c) mastering problem-solving skills; and d) presenting and publishing completed work. These are the skills students need to make effective decisions.

In class, students use Tablets and the teleconferencing capabilities of *ConferenceXP (CXP)* to form multi-cultural Teams, and begin course-related online research assignments. During the semester, students use Tablet inking for note taking on this research. Students access digital databases in the libraries on each campus to complete their research. At regular intervals during the semester, student teams teleconference using *(CXP)* on their Tablets to update other Teams on their research findings. During the semester, students use Tablets to save content (delivered by *PowerPoint 2010*) in *OneNote 2010* workbooks. These *OneNote* files are saved to *SharePoint 2010*. The *SharePoint* server functions as the Cloud presence for the class, making these files accessible by students via smart phones or other intelligent devices they own.

On a regular basis during the semester, students use their Tablets for filling out course evaluation instruments such as pre-, mid-term, and post- questionnaires about course content, team-based learning, and how the knowledge they learned will be applied when they graduate into the "real world."

Tuesday, October 26, 2010

10:45am – 11:15am

TABLET COMPUTING AS ENABLEMENT FOR PERSONALIZED LEARNING COMMUNITIES IN HIGH SCHOOL AND COLLEGE MATHEMATICS CLASSROOMS

Eric Hamilton, Brian Fisher, and Kevin Iga
Pepperdine University, USA

This effort, funded by Microsoft Research, the US Air Force Academy, and Pepperdine University, advances a vision for personalized learning communities in mathematics education. The advent of network communication tools that allow teachers to view student work in thumbnail and full screen form, coupled with tablet computers permitting freehand mathematical notation, permits a new form of classroom dynamics that emphasizes salutary aspects of both individualization and community within the classroom, in an effort to solve the need to elevate mathematical engagement by students. One lens for analyzing classroom dynamics involves the construct of interactional bandwidth, which refers to the quantity of personal and content interaction that can pass over the classroom communication systems. (One way to describe bandwidth involves the use of classroom response systems (CRSs). A classroom that adds a CRS also adds bandwidth, another avenue for important information to cross hands. The same can be said for any configuration that furnishes electronic communication between members of the classroom.) The solution we employ to elevate engagement with tablet computers entails significantly multiplying the interactional bandwidth of a classroom, allowing the teacher and the students to co-navigate large bodies of visual data that a) disclose student mathematical thinking in richer detail; b) enable more timely feedback and more richly informed feedback by the teacher to the student; and c) sustain significantly higher levels of mathematical engagement in the classroom. The pen-based computing solution entailed furnishing every pair of student with one tablet computer, using Windows Journal and collaboration software.

Designing a Web-based System for Tagging Errors in Freshman Calculus Using Pen-Technology

Roy P. Pargas, Eric Anderson, Marilyn Reba , and Calvin Williams
Clemson University, USA

Pen-technology motivated the construction of a large database of student work in Calculus, both inked and scanned, through which the tagging and analysis of student errors and problem-solving strategies becomes possible. To minimize failure rates, we want to know where students in at-risk groups, and students in general, are making errors and then, guided by an extensive statistical error analysis, develop and evaluate new teaching materials and online instructional interventions. Due to collaboration between the Department of Mathematical Sciences and the Department of Computer Science funded both by Hewlett Packard and NSF here at Clemson University, we have been able to enhance the web-based software, *MessageGrid*, to meet the needs of this tagging project. The process of developing an error-analysis study based on tagging involves the interplay of four components: (i) Student Inked-submissions; (ii) Item-Analysis Statistics ; (iii) A Tagging Lexicon; and (iv) Web-based Software. In Summer 2010, several faculty members and graduate students developed a lexicon of errors and tagged 2000+ Calculus I finals from Fall 2009.

Using conceptual maps to support instructors in designing tablet PC based courses.

José-V. Benlloch-Dualde, Félix Buendía, Juan-Carlos Cano, and Lenin Lemus
Technical University of Valencia, Spain

Although there is an extensive literature describing tablet PC based courses at different education levels, it is not easy to find publications that describe how to support instructors in designing such courses.

As the possibilities for tablet PCs grow, it seems appropriate to address the conceptualization of these technologies from an instructional point of view. Among the different tools for organizing and representing knowledge, we have decided to use conceptual maps. We introduce such structures to model both the instructional requirements in a specific educational setting, and the potential tablet PC uses. The main goal in processing these conceptual maps is to look for relationships that ultimately can provide instructors with some guidelines for designing tablet PC based courses.

In order to test this approach a four-hour workshop has been designed. Instructors attending the workshop are invited to answer a pre-workshop questionnaire in order to easily obtain their learning requirements. In fact, the questions presented to the faculty are connected to the concepts and relationships of a rather general instructional map. Then, the instructional possibilities related to tablet PC technologies are presented in a very hands-on way. Finally, a post-workshop questionnaire focused on the technology domain, is presented. This allows us to look the relationships between the two domains.

Even though the approach is still under development, initial results seem promising as a way to help instructors design tablet PC based courses.

We partnered with University faculty development programs to present the grant activities and our assessment findings across campus through a variety of hands-on workshops and presentations. We also partnered with the Admission Office to offer pen-based computing "mock classes" for prospective students visiting campus, and with the alumni office during reunion weekend to engage members of the 50th reunion class in a mock class. These events helped us to broaden campus interest in our project. While our original plans called for a handful of course redesigns, interest in the project has resulted in the use of the equipment in 77 courses enrolling more than 1200 students in 11disciplines. Funds provided by the Academic Vice President allowed us to loan additional Tablet PCs to faculty members for use in teaching and research. The success of these pilots led to the addition of a Tablet PC option to our existing one-to-one computing programs for both students and faculty.

Student Helpdesk Support for Tablet PC and Pen-Based Computing Environment

Kevin Rokuskie
Cary Academy, USA

How can a school district or private school handle the hardware, software and numerous other requests that are associated with a Tablet PC and pen-based computing 1:1 computer environment? It all starts with the information technology staff and the support model that they put in place. If the support is not there for faculty, staff and students, then frustration can mount and with that frustration comes people not using the tablet for what it is meant to be used for. Even if the information technology support staff is there, they might not be able to handle all requests. How can this support be supplemented and added to in the classroom? Utilizing a student helpdesk is a great benefit for the school to use with a Tablet PC and pen-based computing environment. Cary Academy has used a student helpdesk environment since we started using tablets in the fall of 2006. The class is called CANE (Computer and Network Essentials). Upper School students have this as an extra class and come to the information

technology support office located in the middle school, during a study hall, free period or after school. Students learn the basics of hardware and software troubleshooting, networking and minor repairs. This can eventually lead to a summer internship with the information technology staff, that includes a resume and interview process. Learn how to utilize the best resource you have, the students who use the tablets and other pen-based computers.

11:20am – 11:50am

Diffusion of the Tablet PC through the College of Engineering at Virginia Tech
Shreya Kothaneth, Catherine Amelink, Glenda Scales
Virginia Tech, USA

The College of Engineering (COE) at Virginia Tech is considered a vanguard with using new technology to enrich the teaching and learning experience. In 2006, the COE started the Tablet PC initiative which required all incoming engineering freshman students to purchase a Tablet PC. The department of Engineering Education (ENGE) is the first introduction for engineering students to the educational environment within the college as all incoming freshman are required to take two introductory courses offered by the department. A qualitative investigation revealed that ENGE faculty members not only readily adopted the tablet PC but have also helped faculty members outside of their department learn how to effectively use the Tablet. Some of their faculty members are also considered to be champions of various technologies. Interestingly enough, COE has been finding it challenging to get other departments to accept the tablet PC like ENGE did. A 30-minute focus group was conducted in order to understand what motivated the faculty members of ENGE to adopt the tablet PC. The analysis based on Roger Everett's Diffusion of Innovation theory, found a correlation between Rogers' attributes as well as user profiles, and the successful innovation-adoption profile. Thus, we suggest that in order to successfully diffuse an innovation, one must try and increase the relative advantage, compatibility, observability, trialability, and reduce the complexity of a technology. Also, we believe that champions play an important role in the diffusion of a product. Through this work, we hope to help encourage adoption of the tablet PC.

Using Pen-Based Technology to Improve Instruction in Engineering Economics
Glen P. Ciborowski and Bruce V. Mutter
CART, Inc, Bluefield State College, USA

CART, Inc. worked with the School of Engineering Technology and Computer Science (SET) at Bluefield State College (BSC) to implement a more active learning environment for teaching a junior-level engineering economics course (ENGR 315). Using a pen-based Tablet PC coupled with the CART CMS, a Moodle®-based course management service and interactive software, our instructional approach was modified to convert the traditional lecture-based ENGR 315 course to a more student-centered live learning environment. This method is now being planned for introductory mathematics and advanced computer science courses. Results show that the use of pen-based Tablet PC coupled with live capture of the lecture posted on the CART CMS have resulted in better student retention and improved attention during the course. There is evidence of improved student performance and faculty evaluations.

Using the Tablet PC instead of whiteboards, overheads, and blackboards allowed the ENGR 315 instructor to: (1) face students naturally and continually while solving equations; (2) produce cash flow diagrams more accurately and efficiently; (3) eliminate interruptions and distractions caused by physical transitions between whiteboard and projector screen; (4) quickly introduce color during live presentations that further improve understanding of concepts and classroom discussions; (5) facilitate student note taking through CART CMS posts that improve organization and elaboration; (6) accommodate student review for tests and quizzes; (7) provide students with a ready-made, savable, printable, portfolio useful for Fundamentals of Engineering (FE) review and exam preparation, and (8) work more high-quality problem examples due to these increased course delivery efficiencies.

Creativity Unleashed: Digital Ink "Erases" Constraints and Allows Teachers to Focus on Pedagogy
The Impact of Tablet PCs and Pen-based Technology: Going Mainstream, 2010
Robert Baker
Cincinnati Country Day School, USA

Tablet PCs are paradigm-shifting educational tools that have allowed Cincinnati Country Day School to integrate technology as we had dreamed of doing when we first began our laptop program in 1996. These swiveling wonders give teachers the freedom and flexibility to reach beyond the machine and focus on student learning.

A tablet PC 1:1 environment is not evolutionary; it is revolutionary in comparison to a standard laptop deployment. In a non-tablet deployment, so much energy is expended trying to fit the tools to the task. Digital ink allows one to achieve the lofty goals of seamless collaboration, transparent technology integration, and personalized instruction. Tablet pcs allow equations and drawings to be used in collaborative and engaging ways, but without the constraints of time and space. The humanities can also take advantage of digital ink whether it be diagraming sentences, offering inked up feedback on student essays or creating the next great work of art.

Ongoing formative assessment is essential to the learning process. A tablet environment provides you with a window into a student's work, notes, drawings, and process, with near instantaneity. Perhaps this glimpse into a child's methods of essay writing is while they are at home at night, struggling with thesis development; perhaps it is in class while they are solving quadratic equations or graphing parabolas. Because the work is in digital form, and because you have a stylus, you are better equipped to take the pulse of a class and offer feedback in natural and immediate ways.