

## Chapter 23

# Annotation Practices with Pen-Based Technologies

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### ABSTRACT

*This chapter discusses pen-based technologies and their digital ink usage patterns. While traditional instructor inking practices provide opportunities for information to flow in a static unidirectional manner, pen-based computers can be combined with shared writing surfaces, real-time web interfacing, and software to increase the collaboration and interaction between students and the instructor's presentation through active learning. Suggestions of ways post-secondary faculty can utilize digital ink using sound pedagogical practices and a discussion of an experimental study testing the impact of one inking technique used to refine student thinking processes are included.*

### INTRODUCTION

One-to-one computing is the goal of a laptop initiative called *Classroom Connections* in the state of South Dakota. It is a part of the 2010 Education Initiative that provides incentive money for school districts to initiate one-to-one laptop programs for high school students. By fall 2007 there were 41 high schools with 9,600 students and over 1000 teachers participating in the program. Twenty-five percent of South Dakota high school students have tablet PCs 24/7 (24 hours per day, 7 days per week).

South Dakota is not the only state with a plan to get a laptop or tablet PC into every student's hand. *Education Week* in an article by Rhea Borja estimated in 2006 that since Maine started their initiative, almost one-quarter of school districts nationwide and nine states have invested in one-to-one laptop programs. Additionally, the K-12 Computing Blueprint hosted by *Technology & Learning* (2007) stated the demand in all U.S. schools to create one-to-one access for all students is increasing exponentially.

There is a general belief in the potential of this next-generation technology to improve teaching and learning (Metiri Group, 2006). The goal of placing a laptop, notebook, tablet PC, or netbook in every

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student's hand is different for districts and states nationwide, most of which are centered on the development of 21st Century Skills (Center for Digital Education, 2004). But in broader terms, the goals of one-to-one computing can be summarized by what can be accomplished with one-to-one: creating learning environments that are more student-centered by using mobilized software that can accompany students and provide accessibility of technology for all students anytime/anywhere.

One-to-one computing infrastructures are changing constantly to maintain currency with the new technologies that are available. Many states and districts joining the one-to-one initiative or those previous participants now replacing technologies are contemplating moving away from the idea of simply placing a laptop into every student's hand and have begun to consider additional learning opportunities provided by tablet PCs (Milner, 2006) or less expensive alternatives, such as netbooks (Cramer, Beauregard, & Sharma, 2009). This chapter adds to the possibilities of technology-enhanced learning afforded to students through one pen-based technology, namely tablet PCs (see Orlando, 2008).

One advantage tablet PCs have over laptops and netbooks is their ability to digitally ink directly to the display by using a stylus. *Digital Inking* "is the ability to scrawl (i.e., to write or draw awkwardly, hastily, or carelessly) directly on the screen of a tablet PC or convertible laptop...much like writing on a sheet of paper with a pen" (Reins, 2007, p. 159). Inking capabilities built into software applications are considered to be *ink aware*, while other affordances are accomplished by providing an ink layer on top of the document or image. In either case, the ability to fully integrate the digital ink into the document or image is present by saving the file as a specified file type. Many of the applications used for instructional presentation purposes have some type of electronic slide or layer on which an instructor can write prior to, during, and/or post presentation as a way of accomplishing digital inking.

Now that tablet PCs and their ink applications have entered classrooms nationwide, instructors are presumably experimenting with understanding how to leverage the inking capabilities of this tool for (1) enhancement of instruction, (2) curricular changes, (3) affective changes in students and instructors, and/or (4) a noticeable, directed improvement in technology-mediated student learning. There have been many unique models and approaches toward tablet PC implementation, such as a 30-day electronic homework challenge (Dicken, 2008) in a high school mathematics classroom, an upside down teaching approach (Berque, Byers & Myers, 2008) used in a computer science course, or design research conducted since 2006 by the College of Engineering at Virginia Polytechnic Institute and State University in which each year the implementation team reviews and alters existing practices.

One can learn from each of these models as many can be adapted to situations where not all students have a tablet PC or ubiquitous access (i.e., everywhere, all the time). Teacher educators can make generalizations from different approaches, methods, and practices to their respective disciplines that need not be contextually tied to specific applications (e.g., *DyKnow*, *Classroom Presenter*, *Ubiquitous Presenter*, *WriteOn*, and *Microsoft OneNote*). Such perspectives speak to the versatility and adaptability of tablet PCs and their ink applications to various educational environments.

Post-secondary faculty should be concerned with modeling effective pedagogical practices using pen-based technologies based on sound educational theory. Preservice teachers, upon their graduation, should not only have a knowledge base of tablet PCs as tools, but also considerations of their appropriate field use as well as remaining current regarding these constantly changing technologies.

However, the integration of tablet PCs has not always been easy for many postsecondary faculties working with preservice teachers. Anecdotal conversations with the author have revealed a

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