TECH SUPPORT: LEARNING TO TEACH WITH TECHNOLOGY

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As written into national and state-based teaching standards, such as the National Educational Technology Standards (NETS; International Society for Technology in Education (ISTE), 2000), teachers are required to include instructional technologies in their daily practice. Clearly, learning to teach mathematics or science with instructional technologies is not just optional anymore, and neither is it sufficient to only know how to use PowerPoint to create presentations and calculators. Today's teachers can tap into a wealth of technology tools, but how much guidance on pedagogically sound ways of technology inclusion is enough? This paper is a preliminary report on the outcomes of a survey inquiring into what students took away from a graduate-level course on technology integration.

The data collected and presented here stem from a summer course specific to instructional technology inclusion in mathematics and science classrooms and specific to secondary instructional contexts in Texas. Texas mathematics teachers are required to be proficient users and facilitators of the use of technology tools. Beyond the national standards relative to integrating educational technologies in the teaching of content, Texas mathematics teachers are required to teach the use of technologies within the framework of the Texas Essential Knowledge and Skills (TEKS) for Mathematics, Chapter 111. That is, technology integration is mandated by the state in the form of teaching practice as it is embodied by a teacher's lesson, as well as in the form of student use and proficiency as a demonstrated learning outcome.

However, teachers are not only motivated to integrate technology in their teaching by the mandates of standards; another impetus comes from the many career fields of mathematics and science: for example, the use of virtual models in improving the way mathematicians and scientists understand complex systems is commonplace in research and practice. Introducing virtual modeling capabilities into the K-12 learning context is an authentic approach to mirror these "real world" experiences.

The graduate course this paper reports on, *Technology in Curriculum and Instruction* (IST 5303), introduces a variety of educational technologies by first modeling possible uses, and then requires learners to explore these technologies in small groups in regards to pedagogy and logistics. These explorations are followed up on with individual reflections on the in-class experience, as well as reflections of how the technology tool could be, with sound pedagogy, be incorporated into the course participants' own classroom practice. The reflection prompts follow the "warm/cold feedback" strategy frequently used in classrooms. That is, participants were asked to identify positive and negative aspects of the day's explorations, and to identify new questions relative to the tool and its use in the classroom.

The design of the IST 5303 pays particular attention to aspects that scaffold the learning experience of secondary students in concert with constructivist learning theory, and invites participants to holistically consider technology integration throughout the teaching process (lesson design, development, "delivery" and evaluation), as well as to discuss ethical and security issues.

Course participants were in-service mathematics or science teachers who took the course either in the summer semester of 2006 or 2007. Of the nine male and twenty-one female students, three are African-American, fourteen Caucasian, and thirteen Latino. The instructor and course participants jointly developed a listing of a variety of both more traditional and emergent technology tools at the beginning of the course, and then, by majority vote, decided on the final set of topics that included computer applications, as well as tools that could be used either in conjunction with a computer or without (Figure 1 below).

- Computers
  - Productivity tools
  - Multimedia
    - Digital storytelling
    - Podcasting
  - Educational software
  - Internet
    - Simulations
    - WebQuests
    - Blogs and Wikis
  - Course Management System

- Other
  - Classroom Response System
  - Graphing calculators
    - Traditional uses, such as graphing functions
    - Participatory Simulations
  - Probeware
    - with graphing calculators
    - with PASCO and other interfaces
    - with computers

Figure 1: Listing of technology tools explored.

At the beginning of the two summer semesters, a total of nine of the students were rather doubtful that technology integration could be a benefit to either their teaching practice, or to their students' learning experience. Reasons provided in discussions and reflections centered on beliefs that learning the "low-tech" way was proven to be successful and the use of digital technologies would be a distraction rather than enhancement Interesting was that the nine students were rather diverse in terms of age, and including some who were young enough to never have known the "per-digital" world. To some degree this counters the often-cited analogy coined by Marc Prensky (2001) who described the difference between what he termed *digital natives* and *digital immigrants* as one related to age: those who grew up with digital tools and toys are the natives, the others are immigrants.

In spite of the initial skepticism of nearly 1/3 of the participants, by the end of the semester, all thirty students indicated they believed that technology integration was benefitting their teaching practice. The group as a whole got most excited about interactive technologies to which they ascribed a high motivational potential that could sustain engagement, visual technologies for their general appeal and the large potential for teacher and for student created products, and those technologies that were widely and/or freely available. Amongst their favorite were (1) Microsoft's Photo Story 3, because it was an easily learned and applied tool provided as a free download on the internet, (2) Classroom Response Systems (CRSs), because most of their schools did own such a system already and the course gave them opportunities to explore different interaction models; and (3) the NavNLogo participatory simulation functionality of the TI-Navigator system, because it provided them with a new way to think about the calculator as a learning technology, and a new way to explore complex content with their own learners.

In the spring of 2008, a survey was sent out to twenty-four of the course participants who had completed the course either in the summer of 2006 or 2007. Of those, ten responded, resulting in a response rate of 41.7%. Of the ten respondents, eight indicated that they used technology daily or more than once per week, and all ten indicated that the IST course prepared them sufficiently for technology-inclusion in their own classrooms. When asked which technologies they would have benefitted from knowing more about, all indicated specific examples and supported those choices with statements that indicated that heir preparation was, in fact, not sufficient.

The lessons learned from the reflection data indicate that participating teachers valued opportunities to explore technologies on different levels: by taking on the role of the learner, by considering pedagogical and logistic parameters, by reflecting on tool use both as learner and as teacher. As evidenced by survey data, one semester of studying technology integration is not sufficient for all learners as there were clearly unmet needs for all of the survey participants. Notable in that regard is that the contradiction of responses within the same survey, participants indicating sufficiency and insufficiency of preparation, was not apparent to respondents.

Returning to the overarching questions, of what it is teachers need and how much instructional time on technology integration is enough, the preliminary findings presented here essentially do not surprise, but rather support findings already stated in the literature. To prepare teachers for successful integration of educational technologies, the experience needs to be woven throughout programs and not simply concentrated in a single course. In addition, teachers need opportunities to explore concrete examples, to become familiar with pedagogically sound principles of inclusion, and with opportunities to gain technical experience that includes troubleshooting skills.

References

International Society for Technology in Education (ISTE). (2000). National Educational Technology Standards (NETS) and Performance Indicators for Teachers. Eugene, OR: ISTE.

Prensky, M. (2001). Digital Natives, Digital Immigrants. *On the Horizon, 9*(5), 1-6.