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Innovating Innovation: Moving Beyond Productivity in Educational Technology

Educational technology represents a multibillion dollar financial investment, as well as a significant ideological and philosophical investment for many institutions and educators. While there is no question that hardware manufacturers, software publishers, and network service providers are better off, there remains significant debate about the instructional value of educational technology, relative to the costs. Furthermore, helping teachers become proficient in and confident with classroom technologies continues to be a significant challenge for pre-service and in-service teacher educators.

Successes

Schools and school districts have spent more than fifteen years bulking up their technological arsenals—purchasing vast amounts of computer hardware, productivity software, and network connectivity to satisfy the increasing demand that computers exercise a strong presence in the classroom. In some schools this infusion has developed into a critical mass, a point of ubiquity, where computer technology is readily available, accessible, and reliable, such that teachers and students can routinely depend upon the technology as a tool to aid in teaching and learning.

Science classrooms in these schools are often windows into educational technology's "best practices." A large and growing body of research, practitioner literature, and personal experiences suggest that science teachers are among educational technology's "early adopters"—individuals who spontaneously integrate a wide array of technologies to support and enhance the classroom experience. This is often done even when little or no outside support—neither professional development nor technical assistance—is available to the teachers. In turn, students in these classrooms tend to generate distinctive products that utilize technology in unique ways to expand upon and enrich their understanding of content. These products are often built from the perspective of the student (bottom-up), rather than the teacher (top-down). For this reason, these approaches to supplemental technology provide methods of authentic assessment that allow teachers greater access to students' understandings than might be the case with tests or other work.

Vexations

For two years I taught an undergraduate course called "Educational Applications of Technology," and had hoped to expand and apply the positive experiences I'd had with K-12 science teachers to those in all content areas. My students, however, seemed to be lacking much of the innovating spirit that helped the in-service science teachers create outstanding opportunities for students. Even some of the pre-service science teachers were turned off. Although many students entered the class with trepidation about technology itself (e.g.,"Will I break it?") and other things only semi-related to teaching with technology, these students usually ended the course with the greatest appreciation of the instructional value of technology. In many cases, students with reasonably strong technological proficiencies were the hardest to motivate toward a vision of teaching and learning with classroom technology.

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Since this was an upper-level course, I began to search for answers in the depths of our pre-service program. What had shaped the students' attitudes toward instructional innovation? Did an emphasis on standardized curricula and assessment numb students to the potential of other modes of teaching and learning? Was it just too early in their careers for students to be thinking "outside the box?" None of the answers seemed to be at the heart of the problem.

After graduate school and a couple years teaching, I returned to the tech coordinator gig—which includes ongoing faculty in-services—only to find much the same phenomenon in the public schools. While the majority of the faculty is versed in "personal productivity" applications of technology, the innovating teachers were primarily concentrated in science and mathematics, with the humanities trailing despite the availability of Web resources, instructional software, and multimedia authoring software that could give the students an advantage. Does a lack of time, or the perception that technology takes "too much" time keep these teachers out? Are funding structures that favor hardware and connectivity—with minimal funding for professional development—more compatible with science classrooms? Are the "standard-issue" software tools more useful for science teachers, creating the disparity? What in-service techniques—not just "training"—are effective to help get these teachers started?

A great deal of research exists on particular applications of technology and student learning, another group of studies exists specific to science education, while yet another collection of literature exists on professional development. Given all these factors and the existing literature I've read, I'm driven to think that there is something about the nature of science teaching that leads these teachers toward early adoption. My goal is to increase the effectiveness of both pre-service and in-service teacher preparation (in all subject areas, including science) but I must first understand the personal and professional experiences that point these in-service science teachers toward these really fascinating and meaningful applications of educational technology.

Maybe I'm missing one or two key articles that will answer all my questions. Maybe there is one conversation with a certain practicing teacher that will change my perspective. Maybe my relative naïveté about science education is holding me back. But I know that technologies that exist in our classrooms today can be used more effectively, more often, and with greater student impact that what we are doing today. Science education clearly demonstrates this, and we must find ways to transfer the success of this model to other content areas.