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Title: Smoke and Mirrors: Integrating Technology in a Mathematics Classroom

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Abstract: Smoke and Mirrors: Integrating Technology in a Mathematics Classroom

Technology is starting to be seen as the driving force of progress, and education is promoted as the means of change from an industrial age to an emerging information age. Schools are under pressure to provide access to the educational technology as quickly as possible (Cuban, 2001).

It is important to understand technology-human interaction in collegiate-level mathematics education (Stein, 1986; Anderson & Loftsgaarden, 1987; Tucker & Leitzel, 1995). The idea that technology is essential in teaching and learning mathematics and that it enhances students' learning is now commonly accepted. Students can learn mathematics more deeply with appropriate use of technology (Stlohl, 2001; McCoy, 1996; NCTM, 2000).

According to Kaput (1992), the significant limitations of computer use in the near future are likely to be less a result of technological limitations and more result of limited human imagination and the constraints of old habits and social structures. The purpose of my study was to investigate how human limitation affects technology integration by investigating how university professors perceive technology integration and how their perceptions align with students' expectations. I have compared the viewpoints of four university professors with respect to their ideas and philosophies of technology integration. In order to investigate students and professors perceptions of technology integration in a mathematics class, three mathematics professors, one mathematics education professor, and eight of their students were interviewed. In addition, the professors' classroom teachings were observed.

In this study, I adopted Morton's (1996) technology integration definition, which suggests that technology integration is not simply seeing the computer as a "tool", rather as one of the key components of education. I also adopted Paul Ernest's social constructivism as my philosophical stance, and I analyzed my data aligned with grounded theory (Ernest, 1988; Glasser & Strauss,

1967). The interview transcripts and my classroom observation notes were my main data collection methods. I have found that professors' Platonist, problem-solving, and instrumental views of mathematics made an impact on their technology integration. Professors all expressed that technology should be integrated when it is used in a manner to support curriculum objectives and to engage students in meaningful learning; they also expressed that technology should be part of the daily classroom activities and assignments. I also found instructors' understanding of technology integration to be consistent with their values, past experiences and needs. Professors' personal attitudes toward technology became the benchmark in their technology integration. They expressed that students' understanding of mathematics topics were enhanced by their understanding of the topic's visual representations and that technology would best serve students' mathematical concepts development. The professors expressed their concern with students blindly accepting and copying a solution from a graphing calculator or a computer by accepting the machine's authority without reasoning.

On the other hand, students expressed a lack of incorporation of technology into their learning experiences. Students expressed that a passive, lecture-driven style of teaching hindered their potential to be active in their learning and take full benefit of the technological tools. They also expressed that textbook problems were not authentic and not related to their major. Additionally, they found these types of problems were not challenging their capacities as learners; not engaging their unique patterns of interests, talents, and goals; and not presenting learning experiences that they would be able to master, generalize, and retain in order to relate to previous experiences and future expectations. For these reasons, students stated they were not motivated to use technology to solve textbook problems. Students felt guilty when they used graphing calculators, confirming Dunham's (1990) findings in which students expressed that such an approach is not "mathematical" enough and that it would be more valuable for them to use algebraic techniques. Two of the students also

expressed their concern that upper level mathematics instructors would not allow the use of graphing calculators.

I conclude there are four key factors preventing successful technology integration in a mathematics class: Students and professors do not share responsibility for learning, professors do not consider students' voices in technology integration, technology is unevenly integrated and supported among professors, and an inflexible, pre-determined curriculum prevents ease of technology integration.

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