

Chapter 17

Technology in Mathematics Education: A Catalyst for Diversity Leadership

Peter M. Eley
Fayetteville State University, USA

ABSTRACT

Combining both leadership and diversity, the author's define "leadership diversity" to be: leadership that engages followers that is inclusive to gender, culture, and the social context of the followers. In this chapter, a theoretical framework called "Technological Mathematical Leadership Diversity" (TMLD). TMLD refers to using technology to engage all followers' mathematic learning that is inclusive of their gender, culture, and social context. As mathematics educators, it is important to understand that our role as chief instructor is changing; students are now taking control of their education. The infusion of Web 2.0 is changing how students learn and receive their information. The author set out to answer three questions through the TMLD lens: 1) Will the technology be applied to something already done? 2) Will the technology be used in such a way that it improves upon the way an existing task is done? 3) Will the technology allow us to do things that could not easily be done before? Within this context, the authors organize the technology into two distinct categories "productivity" and "cognitive" based off their primary usage. The rising cost of higher education is driving students to find ways to obtain their education in the quickest time and least expensive way possible. While in pursuit of this, it is important that diversity leadership is maintained. Using frameworks such as TMLD, the authors are able to examine the existence and potential effectiveness of a technological tool. These changes can affect mathematics education in a drastic way.

INTRODUCTION

"Electronic technologies—calculators and computers—are essential tools for teaching, learning, and doing mathematics. They furnish images of mathematical ideas, they facilitate organizing and analyzing data, and they compute efficiently and

accurately (NCTM, 2000). Knowing this fact, the National Council of Teachers of Mathematics (NCTM) suggests, "effective teachers maximize the potential of technology to develop students' understanding, stimulate their interest, and increase their proficiency in mathematics" (NCTM, 2008). As student learning and communication evolves so

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does the technologies used to teach these students. More importantly, “In the future, how we educate our children may prove to be more important than how much we educate them” (Friedman, 2005, p. 302). The No Child Left Behind Act of 2001 was developed in response to the breadth of literacy skills necessary for students to be successful in the 21st century workforce as well as the increasing need for technology literacy. The primary goal of Title II, Part D of the No Child Left Behind Act of 2001 is the improvement of “student academic achievement through the use of technology in elementary schools and secondary schools” (Butler, Chavez, & Corbeil, 2007).

Mathematics education has started to recognize the vast possibilities of the digital age for changing how students learn and how teachers teach mathematics. Rapid technological innovations are forcing reform that is bringing changes undreamt of even five years ago and unparalleled in the nation’s history (U.S. Department of Education, 2005). Due to great advances in technology, students today are exposed to unlimited resources that can be adapted for mathematics learning. Students are only limited by their own creative abilities (Eley & Hines, 2011). Advances in technology have opened the door for students to explore mathematics content from real world situations, in real-time furthermore, using teacher creativity; simple computer software can easily be adapted to function in a traditional classroom situation.

Researchers have evidence that suggest; technology can be used to keep students motivated (Eley, 2008). In addition, every opportunity teachers have to use technology, should be incorporated into the classroom (NCTM, 2000; NCTM, 2008). Technology in mathematics is also used as an equity tool for students who need assistive technologies in learning mathematics to overcome disabilities. In contrast, technology can be seen as contributor to disparities because of the larger number of students who may not have access to such technologies (U.S. Department of Commerce, 2006).

Technology is a perfect instrument to introduce leadership diversity to teach mathematics with cultural relevance and rigor. According to Bass (1994), Bass and Avolio (1994) contemporary leadership demands greater emphasis on engaging the follower. However, contemporary leadership models, “have little to say about equity, social justice, or diversity; they do not strive toward inclusiveness or the removal of barriers” (Chin, 2010, p. 153). Diversity is important to the leadership so that he/she “can create an organizational culture responsive to the social contexts expected by its followers” (p. 153).

Combining both leadership and diversity, we define “leadership diversity” to be: leadership that engages followers that is inclusive to, gender, culture and social context of the followers. In this chapter we will emphasis what we will call “Technological Mathematical Leadership Diversity” (TMLD). TMLD refers to using technology to engage all followers’ mathematic learning that is inclusive of their gender, culture, and social context. TMLD is a theoretical framework that was developed by Eley and Moffett (2012). This framework provides a way to categorize, research, and measure, teaching mathematics with technology and student learning. Furthermore, it makes the instructor the lead facilitator, and is inclusive to diversity and equity of learners. Throughout this chapter, we will view the various aspects of using technology to teach mathematics through the lens of TMLD.

As mathematics educators, it is important to understand that our role as chief instructor is changing; students are now taking control of their education. The infusion of Web 2.0 is changing how students learn and receive their information. Webs 2.0 are web applications that promote collaboration and information sharing among users (i.e. wikis). The role of teacher is changing from instructor of information to facilitator of information (Solomon & Schrum, 2007; Ryan & Cooper, 2010). Students can receive news as soon as it happens with Twitter and Facebook on their

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