Chapter 14
Influence of Context in Teachers’ Perception of Graphing Calculator Use in Mathematics Instruction

Francis M. Nzuki
Stockton University, USA

ABSTRACT

This study focuses on the influence of socio-contextual factors in the interrelations between teachers’ perceptions of the role of graphing calculators, as mediating tools, to help facilitate mathematics instruction of students from two different SES backgrounds. The main source of data are in-depth semi-structured interviews with four teachers, two from each SES school. To better understand the role of SES socio-context, this study suggests a framework, consisting of teacher, student, subject matter, and graphing calculator use, for graphing calculator integration in the classroom. The components of the framework were taken to be continuously in interaction with one another implying that a change or perturbation in one of the components affected all the other components. As such, addressing equity issues in connection to the successful integration of graphing calculator in the classroom requires continually creating, maintaining, and re-establishing a dynamic equilibrium among all components of the framework.

INTRODUCTION

Over the last two decades the face of mathematics has been transformed by the widespread use of educational technology including graphing calculators, computer algebra systems and other computer technologies (Forster, 2006). Numerous studies have examined the extensive use of educational technology in daily life, and its effects in supporting and learning in classrooms. In mathematics education, technology facilitates learners to visualize abstract ideas as well as organize and analyze data, so that learners can focus on decision-making, reflection, reasoning, and problem-solving (National Council of Teachers of Mathematics, 2000). Moreover, the transformational power of technology includes enabling
access to new mathematics that couldn’t be taught or learned without technology and enhancing the understanding of key mathematical concepts such as functions (Brown, 2017; Brown & Stillman, 2006).

While new educational technologies are driving the necessary and inevitable change through the educational landscape, the integration of technology presents a new set of variables into the intricate context of learning. Indeed, despite the preponderance of research on the integration of technology into the mathematical classroom, few studies consider the context of learning environment in which technology is used. As Opfer and Pedder (2011) argue, much of the extant literature does not “build on the work of researchers who have shown teaching and learning to be contextually situated .... [and suggest] the majority of writings on the topic continue to focus on specific activities, processes, or programs in isolation from the complex teaching and learning environments in which teachers live,” (p. 377).

Additionally, Healy and Lagrange (2010) pointed out, in integrating technology, teachers encounter various challenges: “Modifying teaching practices to include new tools is no mean feat for teachers. In addition to mastering the various possibilities for doing mathematics offered by different digital tools, they are also faced with the need to rethink a number of classroom management issues, adapt their teaching styles to include new forms of interactions with students, between students and between students and mathematical ideas take a more prominent role in designing learning activities for their students and confront a range of epistemic issues ... It is not surprising then that the process of orchestrating technology-integrated mathematics learning is neither a spontaneous nor rapid one,” (p. 288). Lerman (2001) argues that viewing teachers’ perceptions as static and decontextualized does not adequately explain the interplay between teacher perceptions and their use of technology.

Thus, research on technology integration should focus on the teachers through their context of their social setting because technology should not be separated from factors and features of the context in which it operates or is intended to operate (Bielaczy, 2013). Some of the contextual factors that may contribute to mathematics teaching and learning with technology are the learner characteristics (for example, students’ achievement, behavior, and attitude towards mathematics and technology), teaching approaches, and socioeconomic status (SES). Research documents a direct link between socioeconomic status (SES) and socio-contextual factors including school climate social-family influences and neighborhood and how this link patterns the racialized nature of socioeconomic inequalities as key drivers of racial/ethnic academic achievement gaps. Indeed, socioeconomic status has long been associated with disparities in mathematics achievement.

In addition, the National Assessment of Educational Progress (NAEP) classifies schools as high- or low-SES depending on the percentage of students eligible for free/reduced lunch. Since eligibility for free/reduced lunch is based directly on family income, this implies that majority of the students who attend high (low)-SES schools are those with high (low)-SES. Studies show that schools that enroll students of low-SES have a mean academic achievement that is significantly lower than that of schools with more affluent and high SES students (e.g., Struchens & Silver, 2000). In addition, many researchers argue that there is a strong correlation between race and SES with a disproportionate number of low-SES students being minorities (Struchens & Silver, 2000). Due to this conflation of race and SES, Struchens and Silver (2000) posit that it is sometimes difficult to untangle the two variables to explain the variations in students’ academic achievements. However, many have argued that compared to race, SES is a more important demographic factor to use as a basis for examining the differences in academic achievement (Lubienski, 2001; Struchens & Silver, 2000).

In addition, Krashen and Brown (2005) suggest that SES, per se, is not the cause of the discrepancy in the achievement of low-and high-SES students; rather it is the factors typically associated with SES that...
Related Content

Incorporating a New Technology for Patient Education
[www.igi-global.com/chapter/incorporating-a-new-technology-for-patient-education/111832?camid=4v1a](www.igi-global.com/chapter/incorporating-a-new-technology-for-patient-education/111832?camid=4v1a)

Implementing Emerging Technologies to Support Work-Integrated Learning in Allied Health Education: The Journey From Exploration to Adoption
[www.igi-global.com/chapter/implementing-emerging-technologies-to-support-work-integrated-learning-in-allied-health-education/195979?camid=4v1a](www.igi-global.com/chapter/implementing-emerging-technologies-to-support-work-integrated-learning-in-allied-health-education/195979?camid=4v1a)

Using Communities of Inquiry Online to Perform Tasks of Higher Order Learning
Ramon Tirado-Morueta, Pablo Maraver-López and Ángel Hernando-Gómez (2019). *Advanced Methodologies and Technologies in Modern Education Delivery* (pp. 716-728).
[www.igi-global.com/chapter/using-communities-of-inquiry-online-to-perform-tasks-of-higher-order-learning/212854?camid=4v1a](www.igi-global.com/chapter/using-communities-of-inquiry-online-to-perform-tasks-of-higher-order-learning/212854?camid=4v1a)

Quality Online Learning in Higher Education
Deborah G. Wooldridge, Sandra Poirier and Julia M. Matuga (2019). *Advanced Methodologies and Technologies in Modern Education Delivery* (pp. 663-679).
[www.igi-global.com/chapter/quality-online-learning-in-higher-education/212850?camid=4v1a](www.igi-global.com/chapter/quality-online-learning-in-higher-education/212850?camid=4v1a)