Chapter 10

A Multimodal Discourse on the Use of Touch Enabled Mobile Devices for Mathematics Education

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ABSTRACT

The Technological, Pedagogical and Content Knowledge (TPACK) iPads in School Project aimed to investigate how touch enabled mobile devices, iPads, were used in classrooms. This chapter shares findings from the research selected for their relevance for mathematics education. Qualitative and quantitative research was undertaken in ten West Australian classrooms from kindergarten to year ten, over two years. A community of practice model supported teacher reflection “on action” and “in action” aligned to national standards. Self-tracking video devices gathered evidence on how teachers were using iPads in teaching. Videos were analysed and tagged using multimodal discourse analysis software and a research-based checklist to identify effective pedagogical practices using iPads in mathematics education entitled the TIPs Mobile Pedagogies in Mathematics Checklist (Tips-Mobile-Maths) was developed. A series of short vignettes called “i-Stories” were developed. Social networking connected the teachers and was used for dissemination of research findings.

INTRODUCTION

Fullan (2012) postulated that innovations and new pedagogies are needed to transform teaching and learning to make it appropriate for learners in the 21st century. Yet the use of technology in education can be a highly contentious area. Many countries including Australia have made links between the integration of ICT in education and economic growth on a national and personal level. The UNESCO ICT-CST Project aimed to make connections between education reform, economic growth and the raising of social standards (UNESCO, 2008). There have been many claims that particular technolo-
gies, for example radio or television would transform education. Yet there is little evidence that these changes have occurred. In some cases it is reported that technology programs have been terminated for lack of educational outcomes (Holcomb, 2009; Hu, 2007). There is evidence that if these devices are not used in an effective manner they can be disruptive and can distract the students from the learning goals (Sheppard & Brown, 2011). Thomas and Palmer (2014, 71) stated “A key variable in the use of digital technology in the mathematics classroom is the teacher.” Pierce and Ball (2009), in their study on secondary teachers’ use of technology in mathematics, discuss how the introduction of technology can lead to teacher centred didactic approaches and an increase in drill and practice work. This led to the larger question, what does quality teaching in mathematics look like? Leading to the overarching research question for the research discussed in this chapter “What does effective mathematics teaching which integrates touch-enabled mobile technologies look like?” It can be argued that providing teachers with new technologies does not guarantee that there will be positive educational outcomes. There is a need for research on ways to monitor the quality of teaching and the impact on student learning outcomes when using technology in mathematics education. “Simply buying devices, without considering teachers and their students know how to use them, is of dubious educational value” (Peluso, 2012, 126).

As indicated by United Nations Educational, Scientific and Cultural Organisation (UNESCO) in the quotation below, it is the teachers’ work in classrooms that provides the interface between the rhetoric and reality, teachers make the curriculum tangible for students.

Through the ongoing and effective use of technology in the schooling process, students have the opportunity to acquire important technology capabilities. The key individual in helping students develop these capabilities is the classroom teacher. The teacher is responsible for establishing the classroom environment and preparing the learning opportunities that facilitate students’ use of technology to learn, and communicate. Consequently it is critical that all classroom teachers are prepared to provide their students with these opportunities (UNESCO, 2008, 1).

While there has been a rapid uptake in the use of touch-enabled mobile devices in schools, Peluso (2012) states that there is a lack of research on the use of these devices in a transformative manner. In this research iPads were selected as the touch-enabled mobile device because they are very popular in schools in Australia. The research focus for the TIPS Project was to use video to look carefully at teaching mathematics using iPads and to investigate the factors that support the effective use of these devices as learning and teaching tools. The gap in knowledge that this research aimed to address was how to identify effective pedagogical practices in mathematics teaching when using touch enabled mobile devices. The researchers wanted to consider the range of ways in which teachers were using these devices in their teaching and to investigate if there were any affordances of these devices that would promote different ways of learning and expression “As the iPad is an intuitive device, the emphasis needs to be on pedagogical approaches and task design, rather than on the technical aspects of using the device.” (Goodwin, 2012, 10). Teacher reflection “on action” and “in action” as they viewed videos of their own teaching to identify effective practices and areas for future growth, was an important part of the research methodology. This dilemma of how to prepare and support busy teachers to use new technology in an effective transformative manner with limited time and money informed the development of the research described in this chapter.

A literature review was undertaken to identify current research in effective mathematics teaching and the integration of technology with a specific focus on touch-enabled mobile devices. The literature review