Chapter 12
Teaching Mathematics with Tablet PCs:
A Professional Development Program Targeting Primary School Teachers

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ABSTRACT

Declining interest in mathematics and the need to raise the educational standards of youth in this discipline set a critical agenda for the revision of pedagogical practices. Tablet PCs and other mobile devices hold a lot of promise as tools for improving education at all levels. The research discussed in this chapter comes from an ongoing, multifaceted program designed to explore the potential of tablet technologies for enhancing mathematics teaching and learning at the primary school level. The program is taking place within a private primary school in Cyprus and aims at the effective integration of one-to-one tablet technologies (iPads) into the mathematics school curriculum. It has adopted a systemic approach to the introduction of iPads in the school setting that focuses on the broad preparation and on-going engagement of all key stakeholders involved in the educational process. In the chapter, the authors report on the main experiences gained from Phase 1 of the program, which involved the design and organization of a professional development workshop targeting the school teachers. The authors describe the content and structure of the workshop and discuss its impact on teachers' knowledge, skills, and confidence in incorporating tablet technologies within the mathematics curriculum.

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INTRODUCTION

Educational leaders and professional organizations in mathematics education (e.g. European Commission, 2007; National Council of Teachers of Mathematics, 2000; Common Core Standards in Mathematics, 2010) have, in recent decades, been calling for the adoption of more active learning environments that motivate learners and encourage them through authentic inquiry to establish the relevance and meaning of mathematical concepts. This shift is being reflected in most countries' educational policies and official curricula, which advocate the adoption of inquiry-based, problem-solving approaches to mathematics education. Despite, however, the extensive calls for the uptake of inquiry-based pedagogical models, changing teaching practices is proving difficult. The research literature indicates a disconnection between curricula initiatives and calls for reform and actual classroom practice and suggests the persistence of traditional, teacher-centered approaches (Euler, 2011). Empirical classroom research over several decades shows that, with some notable exceptions, inquiry-based teaching and learning of mathematics is not widely implemented in practice (Mor, Winters, Cerulli, & Björk, 2006). Mathematical ideas are presented in an overly theoretical and abstract manner, without sufficient opportunities for students to engage in problem-solving and experimentation.

Technological advances have provided the opportunity to create an entirely new learning environment in mathematics education by significantly increasing the range and sophistication of possible classroom activities. Access to technology provides teachers and children with tools which, when constructively used, can create opportunities for enhanced learning of mathematics. Although traditional, teacher-centered approaches to mathematics instruction still dominate, there have been several attempts to improve mathematics instruction through the integration of learning technologies. One promising approach lately explored is the potential of hand-held tablet PCs, such as the iPad and Galaxy, as tools for enhancing mathematics teaching and learning. The existing literature indicates strongly the significant potential of tablet devices as ubiquitous tools that can radically transform and enrich mathematics education (Clark & Luckin, 2013; Henderson & Yeow, 2012; Melhuish & Falloon, 2010).

The current chapter contributes to the emerging literature on mobile mathematics learning. It reports on the main experiences gained from a study which aimed at providing a group of in-service primary school teachers with the knowledge, skills, and confidence required to incorporate tablet technologies within the mathematics curriculum.

BACKGROUND

Mathematical literacy is a core literacy that serves as one of the foundational areas of knowledge that drives scientific and technological advancement in knowledge-based economies (European Commission, 2004). Cross-national studies of student achievement (e.g. Trends in International Mathematics and Science Study (TIMSS), Program for International Student Assessment (PISA)) indicate lack of mathematical and scientific competence for a considerable proportion of the student population worldwide. There is also well-documented evidence of declining interest in key science and mathematics topics, and in science careers (e.g. Adleman, 2004; European Commission, 2007; Jenkins & Nelson 2005; OECD 2006; Sjøberg & Schreiner, 2006). The methods of instruction have been identified as contributing to students' low achievement and falling interest in the sciences (Van Langen, 2005). The methods of teaching of mathematics are often viewed as unappealing to the majority of students, as outdated and unconnected with their interests and experiences (Goodrum, Hackling & Rennie, 2001). Ideas are presented in