

Chapter 18

Building Multimedia and Web Resources for Teaching Mathematical Concepts through Their Historical Development

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ABSTRACT

This chapter describes how teachers can use technology to build learning materials and non-traditional lessons that incorporate heritage and history. Students are expected in these lessons to be engaged by a combination of mathematics, cultural heritage, and technological presentation. The chapter describes a project carried out in a teacher training college and presents the structure of the web-based learning environment. Preservice teachers who participated in the project developed the online materials and carried out the educational activities. The technological tools used to build learning materials were based on ICT pedagogical models and were integrated into the mathematical lessons. The chapter also describes various models and teaching settings in which heritage and technology can be utilized and integrated, followed by an example lesson plan which elaborates on the model. The chapter also describes the educational, pedagogical, technical, and logistical difficulties that the preservice teachers confronted during the project. They also struggled with reading historical material and relating it to mathematics. Semi structured interviews revealed that the preservice teachers overcame these difficulties by reflection and by communicating and collaborating with each other and with their lecturers. A questionnaire with yes-no items was used to collect data about attitudes and perceptions of the preservice teachers during the project. They viewed this technological project connected with their heritage as fun, benefiting them, making them proud of their mathematical heritage, and encouraging them to use such projects in their future teaching.

DOI: 10.4018/978-1-60960-044-0.ch018

INTRODUCTION

Educational researches point at the advantages of project based learning (Railsback, 2002; Boaler, 1998a, 1998b; Moore et al., 1996), technology based learning (Arroyo, 1992; Daher, 2009; Koller, Harvey, & Magnotta, 2006) and learning that emphasizes history (Arcavi et al., 1982; Daher, 2005; Kaye, 2008). This is true especially for mathematics education. In this chapter it is our aim to describe preservice teachers' experiences in developing project based, technology based and history based mathematics lessons for middle and elementary Arab schools in Israel. These preservice teachers, majoring in mathematics, computer science and information and communication technology (ICT) in Al-Qasemi teacher training college, built internet sites which include mathematics lessons that use historical materials and technological tools. We will describe the rich experiences of the preservice teachers in developing their projects: building internet sites, designing technology based and history based learning materials and writing mathematical lessons. As well, we will describe the preservice teachers' difficulties in developing their projects and the ways they used to overcome these difficulties.

Research Rationale

Bitner and Bitner (2002) developed eight areas to look at when considering teachers' success to integrate technology into the curriculum: (1) fear of change (2) training in basics (3) personal use (4) teaching models (5) learning base (6) climate (7) motivation and (8) support. Thus, giving preservice teachers opportunities to develop projects that involve building technology based and history based mathematical materials will encourage the preservice teachers to use projects, technology and history of mathematics (which is related to their cultural heritage) in their future teaching. This encouragement will result from their experiences

which are expected to lessen their fear of change, provide them with personal training in successful methods which use technology to produce history based learning materials. At the same time, these experiences would give the preservice teachers alternative teaching models, motivate them to learn in a supportive climate of peers and lecturers, and thus qualify them to use these alternative teaching models as future teachers. Wang (2006) describes technology projects as influencing positively aspects of students' empowerment: autonomy, equality and skill building. This makes technology projects a tool for preparing preservice teachers for a teaching profession that empowers students and contributes to their autonomy, equality and skill building.

Fullan (1982, p. 107) stated that "educational change depends on what teachers do and think--it's as simple and complex as that." We believe that the preservice teachers, developing projects rich in technology and history, will adapt to these new methods and encourage their future students to learn by developing such projects. The adaptation to technology based projects will empower the preservice teachers as learners and future teachers (Keengwe et al., 2007), and thus empower the future generation of students.

The Research Goals

1. To show how mathematical heritage could be utilized technologically and educationally to produce electronic mathematics lessons. This would help educators of other nations, for example, Greeks, Egyptians, Indians, etc. to develop mathematics (or other sciences) lessons and internet sites that are connected to their own history and heritage.
2. To describe the structure of the sites and lessons which the preservice teachers built.
3. To describe the sequences of action taken by the preservice teachers in carrying out their projects.

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