Chapter 40

Comparing the Effectiveness of Using Tablet Computers for Teaching Addition and Subtraction

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ABSTRACT

The purpose of this chapter is to investigate if tablet computers help improve primary school students’ mathematical achievements regarding addition and subtraction. This research compares the level of mathematical competence of the students taught using tablet-computer-oriented learning method which specifically takes advantage of “realistic mathematics education” (RME) for the concept of addition and subtraction, as opposed to traditional teaching methodology. The designed software consisted of several activities with and without the use of computers for addition and subtraction. It was designed following the background of the RME theory. The present study was a pilot research of quasi-experimental design with one experimental and one control groups. The research results show that the students who were taught with the educational intervention based on tablet computers and RME had a significant improvement in their total mathematical achievement, addition, and subtraction in comparison to those taught using the traditional teaching method.

INTRODUCTION

The integration of ICT into primary education has become a high priority for everybody involved in the learning process (Chen, & Chang, 2006; Desoete, Ceulemans, De Weerdt, & Pieters, 2010; Zaranis, & Oikonomidis, 2009). A growing body of literature provides increasing evidence of the effectiveness of using computer technologies to facilitate instruction and learning across a variety of school subjects (Bayraktar, 2002; Bobis, et al., 2005; Clements, 2002; McKenziey, & Voogt, 2009; Trundle, & R. L. Bell, 2010). Particularly, studies have demonstrated that computers have supported the development
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of the abilities in children’s memory, problem-solving, literacy and math (Clements, & Sarama, 2003; Dodge, Colker, & Heroman, 2003; Ihmedieh, 2010; Judge, 2005; Kroesbergen, Van de Rijt, & H Van Luit, 2007; Morrow, L. Gambrell, & M. Pressley, 2003; Starkey, Klein, & Wakeley, 2004; Walcott, et al. 2009). These technologies can therefore play an essential role in achieving the objectives of the first grade curriculum in all sectors and subjects if supported by developmentally appropriate software applications (Brooker, & J. Siraj-Blatchford, 2002; Fischer, & C. W. Gillespie, 2003; Haugland, 1999; Lee, 2009) embedded in appropriate educational scenarios (Dimakos, & Zaranis, 2010; Fesakis, & Kafoussi, 2009; Zaranis, & Kalogiannakis, 2011). Many early-year practitioners and researchers state that the interactive environment created in a primary educational level by using tablets is stronger in maintaining children’s interest towards digital activities, and encourages them to become more closely and effectively involved in digital mathematical activities (Liu, 2013; Risconscente, 2012).

Today, the vast majority of children in the developed world, regardless of their ethnic or socioeconomic background, have access to a smart mobile device (Kyriakides, Meletiou-Mavrotheris, & Prodromou, 2016). Compared to other digital devices (e.g. laptops, mobile phones, and personal computers) the mobile devices with touch screens, are by far the most popular among young children and this trend is growing rapidly (Ofcom, 2014). The intuitive interface of a touch-screen tablet, the ease of installing new apps, the increased portability and autonomy are some of the features which may contribute to their growing popularity in among students (Falloon, 2014; Hirsh-Pasek, Zosh, Golinkoff, Gray, Robb, & Kaufman, 2015; Lynch & Redpath 2012; Neumann & Neumann, 2015).

There have been studies revealing that smart mobile devices, tablets in particular, may have a positive role on improving the teaching and learning of preschoolers (e.g. emerging literacy and mathematics skills) (Kyriakides et al., 2016; Neumann & Neumann, 2015). Unlike other forms of digital technology that are available in the classrooms (Fessakis, Lappas, & Mavroudi, 2015; Lynch & Redpath, 2012), the research on children’s use of smartphones and tablets has shown that it presents very few technical challenges and, as a result, children quickly become enthusiastic users (Flewitt, Messer, & Kucirkova, 2015; Shifflet, Toledo, & Mattoon, 2012). As many students have not sufficiently developed the fine motor skills required to handle conventional computer peripherals such as mice and keyboards, tablets are an attractive tool to implement educational activities for this age group. International studies have shown that first level-age children can handle the applications for such devices relatively easily (Hirsh-Pasek et al., 2015). In light of these shifting views regarding general technology use in first level classroom, tablet computers have been described as particularly suitable for students (Blackwell, Lauricella, & Wartella, 2016).

BACKGROUND

ICT and Teaching Mathematics Concepts in Primary Level

Mathematical operations in conjunction with the contribution of ICT not only facilitate the development of mathematical thinking in young children, but also encourage the creation of new teaching methods which are expected to radically change the way that the teaching of mathematical concepts takes place in early childhood (Pegrum, Oakley, & Faulkner, 2013). In the context of developing early mathematical thinking, even the use of “drill and practice” software can help children develop their mathematical skills in basic math concepts (Clements, 2002; Clements, & Sarama, 2007; Siraj-Blatchford & Whitebread,