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Educational apps from the Android Google Play for Greek preschoolers: A systematic review

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ABSTRACT

In the seven years since the introduction of the tablet (Apple iPad) in 2010, the use of software for smart mobile devices has grown rapidly in popularity and has become a hotly debated issue in the field of education and child development. However, the rise in popularity of mobile applications (apps) mainly addressed to young children is not in line with a corresponding increase in their quality, as there is conflicting evidence about the real value and suitability of educational apps. The purpose of this study was to examine whether self-proclaimed educational apps for Greek preschoolers have been designed in accordance with developmentally appropriate standards to contribute to the social, emotional and cognitive development of children in formal and informal learning environments. The study results were discouraging. The majority of the apps aimed to teach children the basics about numbers and letters. Overall, they were drill-and-practice-style, based on a low level of thinking skills, thereby promoting rote learning, and were unable to contribute to a deeper conceptual understanding of certain concepts.

1. Introduction

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; Papadakis & Kalogiannakis, 2017). 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 among preschool children (Papadakis, Kalogiannakis, & Zaranis, 2016b, 2016a; Falloon, 2014; Hirsh-Pasek et al., 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 preschool classroom (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 preschoolers 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

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educational activities for this age group (Zaranis, Kalogiannakis, & Papadakis, 2013). International studies have shown that preschool-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 early childhood, tablet computers have been described as particularly suitable for early childhood (Blackwell, Lauricella, & Wartella, 2016, p. 62).

Thus, there has been an explosive increase in the number of self-proclaimed educational apps which are available for free or for a fee in the two popular online stores (Google Play and App Store) (Kalogiannakis & Papadakis, 2017; Nadworny, 2017) and aim mostly at the age group below 10 years. Educational apps are defined by Hirsh-Pasek et al. (2015) those in which children "are cognitively active and engaged, when learning experiences are meaningful and socially interactive, and when learning is guided by a specific goal" (p. 5).

However, using smart mobile devices and their accompanying apps, inside and outside the school environment, is not a panacea (Fabian & MacLean, 2014). As stated by Guernsey, Levine, Chiong, and Severns (2012), in the early days of the "Wild West" of apps (p. 9) most apps for preschoolers which were advertised as educational, had very little educational value (Kucirkova, 2016). After reviewing the relevant literature, a key issue emerged regarding the quality of the self-proclaimed educational applications (Neumann & Neumann, 2015). Children's experiences with smart mobile devices, as well as their ability to take part in rich, engaging and dynamic learning environments (Kucirkova, 2014a, 2014b, 2015), are closely linked to the quality of these apps (Neumann & Neumann, 2015; Sandvik, Smørdal, & Østerud, 2012; Verenikina & Kervin, 2011).

For instance, as Verenikina and Kervin (2011) state, several apps are marketed as having educational value for very young children, but, in fact at best, provide few if any educational benefits. Vaala, Ly, and Levine (2015) comment that the vast majority of apps do not meet the standard education requirements for the children of today and tomorrow. In most educational apps, the educational content is based only on the format of closed type questions such as multiple choice questions with only one possible answer. Most apps are not created with an open-type design which allows children to create their own content or explore something without their response being considered erroneous. Thus, children may theoretically be engaged with educational apps, but as they are not age or developmentally appropriate, children simply waste their time with apps which do not give them the opportunity to design, create and to express themselves (Bers & Resnick, 2015).

Since the introduction of the iPad and other tablets, various assessments about the suitability of educational apps for preschoolers were conducted in Western countries. In Greece, there has as yet been no such research for any age group. Additionally, in Greece, there are no state and/or private organizations, like the Common Sense Media or the Children's Technology Review, to test and evaluate educational mobile applications and thus provide a great deal of valuable information to teachers and/or parents.

The key research question under investigation is whether Android apps for preschoolers categorised as educational are appropriate in terms of content, design and of the types of knowledge they promote.

2. Educational mobile apps for preschoolers

Since their first appearance in 2010, iPads and other tablet type devices have been hailed as the medium expected to revolutionize the current practice of education (Allen, Hartley, & Cain, 2015; Kucirkova, 2014a). Characterizations and expressions such as "*are easy to use, trigger students' enthusiasm, increase students' interest, improve students' learning motivation, independence, creativity, etc.*" (Clark & Luckin, 2013, p. 4) or the "*Swiss army knife of technologies*" (O'Bannon & Thomas, 2015) go with almost any text that refers to these devices. The international academic community believes that smart mobile devices, and especially tablets, can serve as an important tool to improve learning and teaching, allowing preschool children to explore advanced concepts once thought to be very demanding and incompatible to that age group (Falloon, 2014; Kucirkova, 2014a; Pitchford, 2014; Yin & Fitzgerald, 2015).

A smart mobile device is an electronic device which, in addition to being relatively inexpensive and portable, has a low weight, great autonomy and increased connectivity with other devices or networks (via USB, WiFi, 3G, 4G, NFC, Bluetooth etc.). These devices generally have a built-in digital camera feature and capabilities for sound recording - playback of digital audio and video data. A smart mobile device comes with an operating system and the ability to use third-party applications. A mobile application or app is software optimized for use with smart mobile devices. The vast majority of adult users and teachers positively evaluate these particular characteristics of the devices and especially the potential educational benefits of thousands of apps (Cubelic & Larwin, 2014; Falloon, 2013; Mango, 2015).

Nowadays, young children are surrounded by technology and use it in their daily lives (Fessakis et al., 2015; Hsin, Li, & Tsai, 2014). Thus, more and more children under the age of eight, even from low-income families, now have access to mobile technology such as smartphones and tablets (Common Sense Media, 2013; Guernsey & Levine, 2016) because of a 'pass-back effect' (Chiong & Shuler, 2010). The 'pass-back effect' happens when a parent or adult passes his/her own device to a child to keep it busy, for example in a car or restaurant (Chiong & Shuler, 2010). These new devices are now being used as 'digital pacifiers' as parents often tend to offer such devices as a reward for children's good behaviour (Kabali et al., 2015).

In the last five years, in the United States, children have been spending more time on mobile devices than watching television (Kris, 2015). Similarly, in the UK, in a recent survey, Livingstone (2016) found that 25% of children aged 0–2 years had their own tablet, with the figure rising to 36% for children ranged in age from 3 to 5 years old. They use these devices for at least 1 h per day (Livingstone, 2016). Several studies have shown that pre-school-age children have the necessary skills to make use of the touch-screen interface using various gestures such as swipe, tap, touch, slide (Aziz, Batmaz, Stone, & Chung, 2013; Brewer et al., 2013; Nacher & Jaen, 2015; Nacher, Jaen, Navarro, Catala, & González, 2015) (see Fig. 1).