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ICT and collaborative co-learning in preschool children who face memory difficulties

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ABSTRACT

Recent development in the role of education in pre-school children includes the use of Information and Communication Technologies (ICTs). ICT nowadays is considered as a tool that can foster the knowledge and the collaborative co-learning for this crucial age and the support of specific areas in kindergarten according to the educational perspective and the areas of needs they serve, is thought important. In this study we present a brief overview of the most representative studies of the last decade (2003–2014), which concentrates on the collaborative co learning and other ICT applications in kindergarten children who face memory difficulties. The effectiveness of ICT in literature, in maths and in children who face learning difficulties is examined. Additionally, the effectiveness of collaborative intervention and diagnostic tools for children with poor working memory in kindergarten children is examined. Concluding, this review, points out certain technological breakthroughs of several researches that focus on the support of children with such deficits.

1. Introduction

Nowadays kindergarten education is thought and considered to be very important in all over the world. As it is believed kindergarten students are very curious to their environment, open to learn and try new activities and thus kindergarten education is thought meaningful to enable them to understand their environment. It is thought also important for kindergarteners to experience and learn by doing and for this reason educating young children is vital for future concept development (Hinostroza, Labbe, & Matamala, 2013). The key role of early childhood education for improving educational outcomes, as well as the collaborative learning, across the educational system has gained international recognition during the last decade, especially among the developing countries (Ananiadou & Claro, 2009). However, in many cases we do not talk only about kindergarten education but also about childhood school as a place where education and collaborative learning are possible and supported by a well-defined pedagogical strategy that includes all the previous caring activities. In childhood school–kindergarten, readiness skills (listening, following directions, etc.) and academics (alphabet skills, colours, numbers, etc.) can be observed. Additionally, cognitive skills, which cover a wide range of mental abilities, including memory and learning strategies can be, also be detected in kindergarten education (Can-Yasar, Inal, Uyanık, & Kandır, 2012).

In the recent years there has been an interesting on educating kindergarten children with the support of Information and Communication Technologies (ICTs) (Drigas & Ioannidou, 2013) and therefore this fact has reinforced the use of technology as a mean of overcoming barriers to their learning enhancing the collaboration among children and school staff (Kucirkova, Messer, Sheehy, & Fernandez Panadero, 2014). However, there is now a general agreement amongst different specialists that ICT can support a child's skills as well as can create a developmental appropriate learning environment depending on the needs they have, the curriculum requirements and the collaboration among the preschool children and the teachers. Their use has been established in primary, secondary and high schools for a number of years now and their profits have been well documented, in many areas (Staarman, 2009).

In addition, many studies have supported the view that ICT can foster the literature, early mathematics, cognitive, emotional–social, motor skills and enhance the creativity and cooperation of kindergarten children as well as can provide children with additional opportunities for rich learning activities that are relevant to their growth characteristics and have positive results in regard to the learning of different topics (Vernadakis, Avgerinos, Tsitskari, & Zachopoulou, 2005). Moreover, attention has focused on an observed engagement factor when students use the devices,

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and how they appear better capable than other technologies such as laptops and desktop computers, to promote learner collaboration. A relative study undertaken by Fisher, Lucas, and Galstyan (2013) compared using iPads and laptops with student pairs, states that students who use iPads reveal significant benefits from using them if learner collaboration is a goal. Also, according to Falloon and Khoo (2014) new devices promise important results that are very encouraging, and underline the potential of collaborative learning environments promising opportunities to raise the quality of students learning.

On the other hand, there is a matter on assessing kindergarten children who need special education with the support of ICT and so the use of new technology as a way to minimize their difficulties and reinforce the cooperation with the school staff and the children is thought a very serious issue (Plowman, Stephen, & McPake, 2010). Existing studies on the introduction of ICTs in pre-school special education argue that can provide children with additional opportunities for rich learning activities that are relevant to their growth characteristics and have positive effects in regard to their learning difficulties (Verenikina, Harris, & Lysaght, 2003). Besides, computing has an indescribable power to influence and connect the population as technological applications promise great expectations for all types of relationships. Additionally, researchers state that preschool children with the support of ICTs can better communicate by enhancing interactive conversations while technological developments affect those children who cannot multitask or face learning difficulties including children with memory problems (Fridin & Yaakobi, 2011).

Specifically, observable behaviours that, probably, show future learning problems in preschool usually, include hyperactivity, impulsivity, cognitive deficits, distractibility, and memory problems (Stevens, 2004). Furthermore, memory is a key ingredient of cognition that plays a basic role in cognitive development. Memory has a number of domains including long term and short-term memory while the short-term memory's main part is working memory and long-term memory consists of a declarative, procedural and perceptual representation system. Close links between memory functions and many aspects of learning and academic achievement in children are well sanctioned. Memory skills of children with special needs have been a domain of great research for professionals over the last years as there are findings that claim that poor memory skills characterize children who fail to progress in different areas of needs. Memory impairments can also have negative consequences on social factors and the sense of personal history besides, this kind of deficits may affect academic performance and can result in low self-esteem. However, it is well known that computerized programs seem to be a promising new approach for collaborative learning as well as for people with cognitive difficulties (Drigas & Dourou, 2013).

Taking the above into consideration, our scoping study drew upon national and international publications as well as the research findings of the most representative studies of the last decade, which concentrate on the use of ICT in the kindergarten in terms of a collaborative learning, in order to support children who face memory problems. This paper will focus on recently conducted studies that introduce software applications programs for diagnosis and intervention purposes of preschoolers who face memory difficulties and need assessment in the areas of literature and math. In addition, intervention tools that support children who have poor working memory as well as children who face learning difficulties accompanied with memory deficits are presented.

2. Diagnostic tools for memory deficits

Early identification and intervention for children with memory problems has been strongly recommended. Professionals in psychological, medical, scientific, and educational fields have stated the importance of the years between birth and five years, for learning. If there is any risk of difficulties, these early years seem even more serious (Blackwell, Cepeda, & Munakata, 2009) as there is a history of research supporting the importance of early identification and intervention. One value of early identification and intervention is that it provides a base for later learning and could thereby raise later academic success experiences for children at risk. In addition, early identification can prevent secondary problems from occurring because it prevents the need for more extensive education services in the future and leads to more inclusive and cooperative programming (Steele, 2004).

According to the above, in a current study, Alloway presented the Automated Working Memory Assessment (AWMA), a standardized computerized tool that can diagnose memory problems. This tool helps teachers and psychologists to assess memory skills with a user-friendly interface. AWMA includes three levels of assessment and is designed for students with suspected-especially-working memory difficulties. General speaking, AWMA is a computer-based assessment that provides three measures each of verbal short-term memory, visuo-spatial short-term memory, verbal working memory, and visuo-spatial working memory (Drigas & Ioannidou, 2013). Specifically, AWMA Short Form (AWMAS) is used for screening learners who are suspected to have memory deficits, but the main area of their difficulties is not known and AWMA Long Form (AWMA-L) which is suitable for confirmation of working memory problems for learners identified as having working memory problems in the classroom (Alloway et al., 2005; Drigas & Ioannidou, 2013).

In a similar research (Nevo & Breznit, 2011) the findings suggest that the ability of working memory skills at 6 years of age, before reading is taught can predict for reading abilities. Specifically, the researchers claim, that among all working memory components, phonological complex memory usually predicts all reading abilities suggesting that a minimal ability of phonological complex memory is necessary for children to gain a normal reading level. In the current study, a battery of 28 tests assessing general and cognitive abilities, were administered to the preschoolers who participated. A total of 11 tasks assessed children's working memory ability. Of these tasks, 9 were taken from the Automated Working Memory Assessment (AWMA) test suite (Alloway et al., 2005), which is suitable for this age, and 2 other tests were developed for the specific study via computer. The AWMA test was originally designed to be administered by computer, with the test items presented on the screen or spoken by the computer to participants in English. However, in the current research only the visuospatial subtests were administered via computer and the examiners in their language administered the verbal subtests orally. All children were tested in a quiet place by two examiners and the results claim that the tests that were revised in similar versions a year later have practical implications for the early identification of reading difficulties as well as for the design of optimal intervention about the memory difficulties.

Furthermore, Aristodemou, Taraszow, Laouris, Papadopoulos, and Makris (2008) developed a battery of Internet based applications which collectively operate as a screening test of cognitive abilities capable not only to predict children at risk of learning difficulties but moreover to equip the teacher with a profile of mental abilities relevant for choosing and designing personalized programs. This study evaluated the capability of the new computerized cognitive battery of tests to predict reading performance. Specifically, the MAPS (Mental Attributes Profiling System) battery addressed eight major domains of language independent tests that have been linked to learning difficulties (such as short-term and visual memory, short-term auditory memory, and auditory and visual discrimination). The findings of the research suggest that

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