

# Using computers in early years education: What are the effects on children's development? Some suggestions concerning beneficial computer practice.

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## Abstract

Technology in education is considered in empirical and theoretical literature as both beneficial and harmful to children's development. In the field of the early years settings there is a dilemma whether or not early childhood teachers should use technology as a teaching and learning resource. This paper has a pedagogical focus, discussing the advantages and the potential problems of computer practice to children's learning and behaviour in the early years settings and also suggests teaching methodologies concerning beneficial computer practice. It establishes the educational value of technology, by linking digital activities to the relevant pedagogical learning theories that support this context. It is argued that implementing technological activities in the early years settings has beneficial results in children's learning, when children interact with each other and adults guide discreetly their activities. In contrast, children's individual overuse of computer activities may have negative effects on their learning and behaviour. The concluding remarks indicate the effectiveness of computer use in the field of the early years settings and the important contribution of adults in this practice. They further suggest teaching methodologies of computer use that have a beneficial impact on children's learning. Their implications are discussed in the context of motivating researchers to further investigate the effects of digital activities in children's learning but also as an interesting teaching and learning resource to early childhood teachers in everyday computer practice.

## Key words

Early years settings, computers in education, pedagogical theories, teaching and learning methodologies

## Περίληψη

Οι τεχνολογικές δραστηριότητες στο χώρο της εκπαίδευσης έχουν χαρακτηριστεί ως ευεργετικές αλλά ταυτόχρονα και ως αρνητικές ως προς την ολόπλευρη ανάπτυξη των παιδιών. Ειδικότερα, στο χώρο της προσχολικής αγωγής υπάρχει ένα δίλημμα στο αν θα πρέπει οι παιδαγωγοί να χρησιμοποιούν την τεχνολογία ως ένα εργαλείο διδασκαλίας και μάθησης. Αυτή η εργασία εστιάζει στην παιδαγωγική πλευρά αυτού του ζητήματος, συζητώντας τα πλεονεκτήματα και τα μειονεκτήματα των τεχνολογικών δραστηριοτήτων στην ολόπλευρη ανάπτυξη των παιδιών στην προσχολική ηλικία και προτείνει διδακτικές μεθοδολογίες για την παιδαγωγική χρήση του υπολογιστή στο νηπιαγωγείο. Τεκμηριώνει την παιδαγωγική αξία της τεχνολογίας στην προσχολική αγωγή, συνδέοντας τις ψηφιακές δραστηριότητες με τις ανάλογες παιδαγωγικές θεωρίες μάθησης. Βασικό επιχείρημα αυτής της εργασίας είναι ότι οι τεχνολογικές δραστηριότητες στο χώρο της προσχολικής αγωγής έχουν ευεργετικά αποτελέσματα στη μάθηση των μικρών παιδιών όταν τα παιδιά αλληλεπιδρούν μεταξύ τους και υπάρχει η διακριτική καθοδήγηση του ενήλικα. Ωστόσο, μία συνεχής ατομική χρήση του υπολογιστή από τα μικρά παιδιά μπορεί να έχει αρνητικές συνέπειες στη μάθηση και στη συμπεριφορά τους. Στα συμπεράσματα σημειώνεται η ευεργετική επίδραση της τεχνολογίας στο χώρο της προσχολικής εκπαίδευσης και η σημαντική συμβολή του ενήλικα σε αυτήν την πρακτική. Προτείνονται, επίσης, διδακτικές μεθοδολογίες όσον αφορά την παιδαγωγική πρακτική του υπολογιστή ως εργαλείο διδασκαλίας και μάθησης στο νηπιαγωγείο. Αυτή η εργασία μπορεί να αποτελέσει ενδιαφέρον εργαλείο για τους ερευνητές μιας και το ερευνητικό βάρος έχει δοθεί στις

μεγαλύτερες βαθμίδες της εκπαίδευσης, καθώς επίσης και για τους παιδαγωγούς στην καθημερινή χρήση της τεχνολογίας από την παιδαγωγική ομάδα.

## **1. Introduction**

Information and Communication Technology (ICT) is an important component of early years education. Technology provides interesting activities for young students, maintaining a playful and pleasant atmosphere (Lewin, 2000). It further helps other learning, offering opportunities to experience the same topic in several ways.

Computer use in the early years context may have both beneficial and negative effects. Hertzog & Klein (2005:25) support that ‘when used appropriately, technology has the potential to make a substantial positive contribution to young children’s learning’. On the other hand, there has been some dispute about whether technology in the early years is beneficial such as when Cordes & Miller (2000) reported that there was no convincing evidence of the value of computers in the early levels of education, also describing many negative impacts on children’s health and learning.

This paper discusses the advantages and the potential problems of digital activities in the early years context, with particular focus on 5-year-old students. It links computer practice in the early years settings to the relevant pedagogical learning theories and suggests methodologies that early childhood teachers could use to everyday computer practice. This paper argues that technology has the opportunity to be beneficial under the adult assistance but children’s individual overuse may have negative effects on their learning and socialisation.

The following section 2 presents the empirical findings and the relevant pedagogical learning theories, correlating them with the use of computers in the early years settings. It further suggests teaching and learning methodologies, concerning beneficial everyday practice of technology in this context. Section 3 summarises the discussion before drawing relevant conclusions.

## **2. Pedagogical learning theories and empirical findings**

It is of great importance, teaching resources in the early years settings to be underpinned by the relevant learning theories in order to establish and justify their educational value.

Social Constructivism is a significant pedagogical theory, supporting computer use in the early years settings and establishing its educational value. Vygotsky (1978), one of the basic representatives of this theory, demonstrates that the process of internalising new knowledge undergoes multiple stages of change. Vygotsky (1978:57) supports that ‘every function in the child’s cultural development appears twice: first, on the social level, and later, on the individual level; first between people (interpsychological), and then inside the child (intrapsychological). All the higher functions originate as actual relations between human individuals’. In other words, he suggests that learning procedure occurs and develops within the individuals’ social interactions.

These social interactions are obvious in 5-year-olds’ play. Aubrey (2008:9) describes children at this age as ‘active social agents’. Young students obtain continuously new cognitive constructs through imitating their peers and their teachers (Hujala, 2002). The early years curriculum has a playful character, enhancing children to interact with each other and to utilise this interaction in their future activities. Social Constructivism theory links to computer practice in 5-year-old students, establishing its pedagogical value. In this context, children engage in technological activities and help one another to overcome the difficult parts of their learning tasks. In this way, digital activities enable them to acquire precious new knowledge through their interactions. Plowman & Stephen (2005) confirm this, concluding that during computer activities pre-school students interacted with each other in order to correct their mistakes. Based on these arguments, digital activities in the early years settings promote children’s interaction and contribute beneficially to children’s learning.

The ‘Zone of Proximal Development’ (ZPD) is another important pedagogical approach that underpins and justifies the educational value of computer practice in 5-year-old students. Vygotsky (1978:86), considering the true relationship between learning and development, identifies that ‘ZPD is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers’. In other words, he suggests that there are constructs that children are able to learn by themselves; constructs in the ZPD that children are capable to learn

through mediation and constructs that children do not have the mental ability to learn at a specific age. Therefore, the ZPD expands as students get older through education.

Early years education is strongly characterised by the 'Zone of Proximal Development' because children are too young to discover all the scientific truth by themselves. Wood (1988) documents a number of remarkable paradigms, where 5-year-old children improved their cognitive abilities through adult assistance. He recognises that although young children have the mental ability to reproduce an academic task in their free play, they will not utilise this technique impulsively. Therefore, adult guidance is necessary to enhance their learning. The 'Zone of Proximal Development' is absolutely crucial in the implementation of technology in the early years context. Young students can easily neglect the pedagogical purpose of their technological activities, engaging in individual unlimited hours of computer games with no educational value. The study of Klein, Nir-Gal & Darom (2000) supports this, concluding that there were better cognitive outcomes in technological activities when 5-year-old children were enhanced by adults in contrast with children in groups with no adult mediation.

Another important pedagogical theory is Behaviorism. In this theory, learners have to attain new academic knowledge by studying on their own time (Mergel, 1998). Although this theory is not directly applicable to the early years context and computer activities in this area, it illustrates children's individual activities in their free time. Canning (2007) supports this by describing situations where young children reproduced the interactions they had with adults in their free play. Likewise, 5-year-old students sometimes practice in their free time the computer activities they had with adults. Nevertheless, these activities are not enforced by teachers like in Behaviorism theory because children engage voluntarily, but it mirrors children's activities within this theory.

The existing empirical findings further verify the effectiveness and the educational value of computer use in the early years settings, as technological activities enhanced children's other learning. However, analysing their research methodology, it can be argued that some of them are not underpinned by the relevant learning theories.

Researchers like Comaskey, Savage & Abrami (2009), Klein, Nir-Gal & Darom (2000), Segers & Verhoeven (2005) and Lewin (2000) verify the positive impact of technology on children's learning and support the argument that technology has a positive impact on children's learning and attitude with adult assistance. The research methodology of the first two studies is underpinned clearly by Social Constructivism theory and the 'Zone of Proximal Development', as children interacted with each other and they were also enhanced by adults during computer activities. In contrast, the work of Segers & Verhoeven (2005) and Lewin (2000) is more supported by the Behaviorist approach rather than by Social Constructivism theory and the 'Zone of Proximal Development' because children wore headphones during digital activities and thus, they were working individually. As discussed previously, early years education is supported more by Social Constructivism theory and the ZPD rather than by the Behaviorist approach. However, it is suggested that these findings could have been supported by Social Constructivism theory if the students discussed with their peers and with their teacher their digital experience and thus, they provided the desirable interaction within this theory.

This leads us to suggest that computer activities in the early years settings verify their educational value as they are underpinned by the relevant pedagogical theoretical approaches and are supported by the existing empirical findings. It is of vital importance the manner that children utilise digital activities because an individual overuse of these activities could have negative effects on children's learning and behaviour. This paper suggests that a beneficial teaching and learning methodology in technological activities should be underpinned by Social Constructivism theory and the Zone of Proximal Development. Being more specific, it is argued that there are positive effects on children's learning and behaviour when the technological resources are used by small groups of young children that are guided discreetly by adults instead of each child individually. One main argument is that in this way children have the opportunity to interact with each other and gain precious knowledge using their interaction with others. It is further suggested that teachers could use children's individual digital activities and have positive outcomes. This could be achieved, when children discuss their individual technological activities, share the digital problems they have encountered and try to find together a solution.

On the other hand, there has been a disagreement about the positive effects of technology on children's learning, when Cordes & Miller (2000:9) argued that there was no valid evidence about the

value of computers in the early years settings and characterised computer practice as ‘the end of childhood’. They further accused early digital activities of health sequences like obesity, musculoskeletal and vision problems, and negative impacts on children’s socialisation. It has to be acknowledged that Cordes’s & Miller’s (2000) arguments are partly true. Technological activities can have positive effects on children’s learning and development when they are utilised by small groups of children and there is a discreet adult mediation and thus, they are underpinned by the relevant pedagogical theories.

### **3. Concluding remarks**

This paper had a pedagogical focus, discussing the advantages and the potential problems of ICT activities in early years education. Computer activities verify their educational value in the early years settings as they are supported by the relevant pedagogical theories. The existing empirical findings further establish the argument about the pedagogical value of early digital activities but analysing their research methodology it can be argued that some of them are not clearly underpinned by the relevant learning theories. It is suggested that these findings could have been applicable to Social Constructivism theory if children interacted with their teacher or with their peers after computer activities, discussing and sharing their experience. In contrast with Cordes’s and Miller’s (2000) arguments, there are convincing empirical findings about the beneficial effects of digital activities but some of them need to be implemented cautiously because they suggest individual activities and children do not interact with each other.

As Donaldson (1978:99) points out ‘much will depend on the manner of the teaching’. Technological activities in the early years settings can have both positive and negative effects on children’s learning and behaviour, depending on the manner that young children utilise them. This paper suggests that early digital activities can have beneficial effects on children’s learning, when they are supported by Social Constructivism theory and the ‘Zone of Proximal Development’. This could be accomplished when children utilise computer activities in small groups but also when children interact with each other after their individual digital activities, discussing their experience and sharing their thoughts and problems. In this teaching and learning methodology it is further suggested that adults should discreetly assist children in their technological activities. This paper highlighted the beneficial impact of technology on children’s learning but also the potential problems of an individual overuse of computer activities. This paper could be used to motivate researchers to further investigate the effects of early technological activities that are underpinned by the relevant learning theories, but also as an interesting teaching and learning resource to early childhood teachers in their everyday computer practice with children.

To summarise, technology practice has the possibility to contribute beneficially to young children’s development when it is supported by the relevant pedagogical learning theories. Utilising technology in ways that children can interact, communicate and cooperate with each other can promote positive outcomes to their learning and behaviour. It is also important that adults guide discreetly children in their digital activities in order to assist them to advance their mental abilities.

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