

Transference of Learning from Play with iPads in Early Childhood

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Abstract: Whether it is the alphabet, a song, or knowledge of touchscreen navigation, young children now routinely learn many things while playing with iPads and similar devices. Despite this child-friendly technology clearly stimulating engagement there also exist significant debates about this topic among early childhood education professionals. This paper reports on a small research project that investigates: a) whether touch screen digital devices can provide young children with practical and educational information; b) whether these children can transfer their learning through individual play with such devices; c) what factors need to be considered that could improve the learning outcomes of young children; and, d) how young children manifest their learning outcomes. Through an observational case-study that involved young (2-year old) children we observed the transfer of learning from 2D sources to 3D objects and the ability of these children in drawing 2D images from understanding 3D objects. Although a video deficit effect showed young children displaying poorer ability in transferring learning from 2D sources to 3D objects relative to their ability to do likewise from a live demonstration, these children were effective at transferring their learning from 2D sources to 3D objects. However, it was also found that to be effective requires multiple presentations, experience and assistance of language cues to scaffold their understanding. These findings suggest that parents and teachers could further examine the value of using 2D sources, such as television, videos, computers and touch screens in this way.

Keywords: Touch screen technology, learning transfer, iPad, play, childhood

1. Introduction

Teaching and learning in early childhood education has a long history of development and debate (Berk, 2013; Whitebread & Coltman, 2015). Today, with the stimulus of innovations in digital technology and increased exposure of developmental issues in the media, there is increasing attention from parents, early childhood educators and higher education institutions that teach early childhood educators. But while technology can be seen to have stimulated engagement it has also been a topic for debate with the efficacy of touch screen technologies such as iPads commonly discussed and explored.

There exists an increasing variety of tablets available for personal and technical use worldwide. In marketing the benefits of iPads for developing fine motor skills, Apple (2011) explains that their product “features a large, high-precision, touch-sensitive display that requires no physical force, just simple contact with its surface”. More and more young children in the developed world have access to these devices and special apps have been designed specifically for early childhood education. As a consequence there exists a need to investigate the use of iPads in children’s learning, particularly in terms of their transference of knowledge and skills. This paper investigates this issue from a small case-study with immediate connection with this theorised field.

In previous studies, children’s knowledge transfer when using educational media has been emphasised. For example, Linebarger and Walker (2004) observed that language development of infants and toddlers can be transferred from viewing television although they also highlighted the importance of content and program type when describing media effects. In another study Vandewater et al (2007) provide important results regarding the extent of media use among young children; however, they emphasised the role of a media-saturated environment in which media and technology are playing an increasing and crucial role in young children’s daily life. Hayne (2004) stated that there are significant developmental changes which can occur in young children’s learning particularly when they

encode information from a 2D resource and apply it to 3D objects. Other researchers, such as Barnett and Ceci (2002), Barr (2010) and Hayne (2004), demonstrate that for young children forming an internal mental representation of the target 3D objects depends on the features of the context of the 2D resources. Therefore, based upon the results from those studies, the present study aims to validate whether children can transfer their learning from a two dimensional (2D) source to a three dimensional (3D) object.

The interface associated with iPads involves the use of touch screen technology, a technology that has been enthusiastically embraced within the educational sector, although to a greater extent in schools than preschools. The tactile nature of touch screen technology fits well with early childhood pedagogies and the requirements of fine motor development of children within the early childhood age range. For example, in one of the few research projects done on tablet computers and preschool aged children, Geng and Disney (2013) demonstrated that young children above the age of three years old were able to learn and transfer their learning by using touch screen technologies. Other researchers such as Gerhardstein and Roveen-Collier (2002), Sutton (2006), Subiaul et al (2007), and Zack et al (2009) have already studied the touch screen technology with the limitation for young children to transfer from 2D to 3D and vice versa. However, from a pedagogical standpoint, opponents of using touch screen technology in early childhood settings raise two issues, the first being that it does not fit with children's need for concrete materials and that technology does not support authentic, hands-on experiences, but rather promotes mediated or symbolic ones, hence limiting the opportunity for authentic learning (Struppert et al, 2010, p. 282). Secondly, within a play based learning environment children learn cognitive skills by being scaffolded in their learning by adults and peers and the weakest aspect of software can be its limited ability to provide specific or adaptive feedback to the user to assist their understanding of process, rather software provides answers as to correctness (Sim et al, 2006). In defence of using information technology, Garris, Ahlers and Driskell (2002) explain that computer games actually promote active learning, in that learners learn by doing. Grabe and Grabe (2007) also argue that certain phenomena can be too difficult or in some cases impossible to observe without the aid of technology, therefore the ability to observe and manipulate phenomena via digital play allows for the learner to put objects into identifiable order that may not have been capable without technological assistance, hence leading to concreteness for the learners. Furthermore, in terms of children's interaction with adults and peers while playing, Lee (2009) describes that in an appropriately designed early childhood environment, children should have access to both adults and peers that will assist the scaffolding of children's digital play.

Connecting learning through the use of iPads to the early childhood pedagogy of play is now commonly referred to as *digital play* which includes "play with digital devices and media; this includes children's play with computer software and game consoles that connect to a computer" (Highfield, 2010, p. 194). From a developmental perspective, experts believe that symbolic and imaginative play provides the foundations for all domains of development (Ebbeck & Waniganayake, 2009). Gonzalez-Mena (2008) justifies the use of play for children by explaining that play is a "developmentally appropriate practice", in that it directly relates to children's stage of development as defined by theorists. Moreover, within early childhood settings "play and learning are inextricably woven together; play is intrinsically motivated and powerful for children in all cultures" (Ebbeck & Waniganayake, 2009, p. 5). Therefore, there are concerns from researchers and educators about the challenges and issues of using iPads in early childhood educational settings. For example, there is limited literature on whether the use of touch screen technology can assist young children's learning in their cognitive and physical development, because young children learn through their bodies, using their eyes, ears, mouths, hands, and legs (Haugland, 2000). There is also limited research conducted that measures whether young children can learn cognitively by using an iPad, although it is acknowledged that touch screen technology has been used widely around with young children. In addition, little research has been conducted about whether young children, especially preschoolers, are able to learn in the process of digital play and transfer their learning to understanding the concepts of 3D objects. Hence, our research aimed to investigate the ability of young children to learn while playing with an iPad and to transfer their learning to 3D objects.

2. Methods

This research used qualitative research methodology in which an observational case study was undertaken: “a case study of a current phenomenon for which observations could be used to supplement documents and interviews is called an observational case study” (Wiersma & Jurs, 2009, p. 241). Denzin and Lincoln (2005) stated that observation is a fundamental basis in the social and behavioral sciences; and it is possible to conduct observations in settings that are natural loci of those activities that may be the result of a controlled experiment.

“Young children draw what they know while older children draw what they see” (Willats, 2005, p. 23), and children learn to draw and draw to learn (Anning, 2002). In this study, children’s drawings were used as an assessment method against their learning outcomes. Drawings are one of the most primitive forms of children’s expression and communication (Mitchell & Ziegler, 2007; Young & Noel, 2006). Drawings have been regarded as an effective means for children to explore their understandings (Steel, 1999). Cox (2005) further states that drawing is a constructive way of thinking-in-action; and, by paying attention to their narratives and interpretations as they draw, we can learn about children’s experience and views (Veale, 2005). In Einarsdottira et al (2009) children’s drawings were used to assist teachers in examining the beliefs and values underlying their pedagogical practices. In addition, the longitudinal study of young children drawing by Anne and Ring (2004) has extended our understanding of drawing as a tool for constructing and sharing meaning.

2.1 Participants

Five children (3 females and 2 males) participated in this research. They were all normally developed children with no specific needs. They were labeled as Child A, B, C, D and E. Child E was 2 years 5 months old, and all the other four children were between 3 years 0 months to 3 years 7 months.

2.2 Procedure

The research was conducted in five quiet households in Australia and China during February to December, 2011. Each child was invited to play an iPad game/program called *Animals 360* (Figure 1). The colourful game/app was designed to enable different ways of exploring, such as introducing animals’ habits, eating, sounds and living status. Children can play the app by watching videos, touching screens to listen to different sounds, and browsing different pictures. Some simple tasks, such as a taking a tour and quizzes also facilitate engagement. Each child was allowed 30 minutes to play the game. After the 30 minutes, they were asked to draw a picture of a cat with pen and paper. Observation was undertaken with the minimum of disruption during the procedure. Children were allowed to talk and interpret their drawings during the period. Notes of children’s answers were taken.



Figure 1. *Animals 360* (<https://itunes.apple.com/au/app/animals-360/id339158840?mt=8>)

3. Results

Four children out of the five played the iPad game continuously for 30 minutes, while the youngest child (Child E), who was 2 years and 5 months, only spent approximately 15 minutes on playing the game. However, all of the five participants demonstrated their understanding of the image of a cat in the iPad game, by pronouncing clearly and correctly the word “cat” while playing the game and drawing their cats.

Although the findings showed the children's expressions of their drawing's meaning and understanding (Ring, 2006), their drawings of their understanding of the cats were very different (see Figures 2 to 6). Given that all the participating children were under four years old, they were still in what is commonly referred to as the scribble age of children's drawing development (Berk, 2013).

Child A did not draw a clear image of a cat (see Figure 2), and said that the cat was moving around and jumping here and there. She was drawing a cat's movement instead of the still image of a cat. This showed that Child A's perception of a cat was not just a 2D image, and Child A had transferred her learning from playing with iPad into a 3D cat's trace of moving. Child B and Child C's drawings show more clearly a cat's face. Their cats had eyes, mouth and nose. Child B also drew some hair of her cat. Child C's drawing had eyes, ears, legs, and even whiskers. In comparison, Child D emphasized his understanding of cat's head and tail (see Figure 5). Child E was the youngest of the all the participants and his drawing lost traces of a cat (see Figure 6). When he was asked to interpret his drawing, he could not explain clearly what cat body parts he was drawing.



Figure 2. Child A's drawing of a cat.



Figure 3. Child C's drawing of a cat.

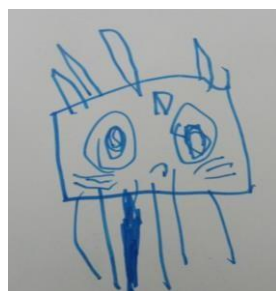


Figure 4. Child C's drawing of a cat.

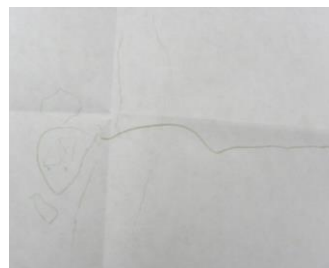


Figure 5. Child D's drawing of a cat.

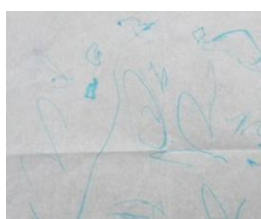


Figure 6. Child E's drawing of a cat.

4. Discussion and Conclusion

While the study reported in this paper only examined the behaviour of five young children (2-3-year-olds)'s playing with iPads, their abilities in transferring their learning from 2D sources (iPads) to 3D objects was observable in each case. It was found that these young children, especially those who were over 3 years old, had the ability to understand their learning concepts from playing with an iPad and transfer their learning from 2D sources to 3D objects. Children under 3 years old, however, did not have this ability as fully developed as the other children and this can be explained as owing to stage of their language development.

This small study makes four important conclusions to our knowledge on the use of iPads in early childhood education settings.

1. Touch screen technology on tablets such as iPads can provide young children, in particular children over 3 years old, with access to practical and educational information about learning via an individual or personal media platform like books. Such technology is quite distinct from other electronic media such as whiteboards, videos, or Television. A transfer of learning across content and context (Barnett & Ceci, 2002; Hayne, 2004; Linebarger, D & Walker, D; 2005; Vandewater et al., 2007) was observed for children over 3 years old while playing with such touch screen devices.
2. Although four participating children demonstrated their understanding of a cat, none of them could draw a whole cat image. For example, Child A only drew the movement of the cats and Child B, C and D could only draw their memories of some important cat body parts. This may be explained as (a) children's understanding from playing the iPad game being linked with their thinking, talking and reading from the images and (b) iPad games providing the children with higher task complexity but disrupting their transfer of learning (Yang & Noel, 2006). However, the findings are consistent with findings from Willats (2005) and Yang and Noel (2006) that young children draw based upon their knowing, while older children draw based on their seeing and their drawings were linked to their thinking, talking and reading.
3. Young children could learn and develop their cognitive skills while they were playing (Garries et al, 2002); and only 'playing' with an iPad individually might not help young children learn or grasp the knowledge completely or correctly. It was found that none of the participating children received what might be regarded as adequate feedback from the game itself while they were playing apart from responding to their touch-based input; therefore, their responses in their drawings were very different. Playing an iPad individually may contribute to the differences, although information technology should provide answers to learners as to correctness. This finding supports Lee's (2009) findings that assistance from teachers or peers' interaction plays an important role in scaffolding children's digital play.
4. When the children were exposed to a variety of different experiences of learning, such as touch screens, their understanding is further developed when they experience multiple representations, such as language cues. Together, these multiple cues can be seen to facilitate their transference of learning, especially for children over 3 years old. However, for children under 3 years old in this study, it was found that the use of drawing and language cues could not scaffold their understanding of concepts. For example, Child E had not yet developed the language communicative abilities, making it difficult to interpret his drawing. These findings are consistent with Mitchell and Ziegler (2007) finding that drawings are one of the most primitive forms of children's expression and communication and also consistent with the statement that drawing and accompanying narrative are integral parts of the meaning-making process (Cox, 2005; Einarsdottira et al, 2009).

There are a number of limitations of this research. The data was solely based upon five children, which clearly limits any generalisation among other children. Only one iPad app was used in this study. All the five children were asked to play individually; therefore no collaborative play was studied. In addition, adults' assistance for these children was not studied either. As a consequence, a number of future research directions can be identified. Further research needs to be conducted with more participating children from different age groups, more iPad apps, involving a range of different curricula – larger samples might enable in-depth exploration using quantitative content analysis or behavioural analysis. Investigating young children's interaction while playing iPads in pairs or groups as well as the impact of how teachers or carers could be empowered also look like worthwhile topics for future research.

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