Augmented Reality in Early Childhood Literacy

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ABSTRACT

Augmented Reality (AR) refers to technologies that superimpose virtual objects over real-world objects. AR has recently received a lot of attention within the educational context and has started to be explored in how it can support learning in a variety of domains, however, research on how it can be effectively used to engage younger children is still limited. However, emerging research shows that the application of AR alongside game-based learning may be a way to better tap into children's interests and promote reading. AR is poised to be an interesting and powerful tool for education, and its utilization in early childhood literacy is ripe for research. The poster presents an overview of a research project initiated to explore how AR can be used to support early childhood literacy. The poster describes a prototype that has been developed which the aims to help explore how AR technology can be adopted to increase the interaction and motivation level of children while they learn English alphabet phonics.

Keywords: Augmented reality, early childhood education, mobile technology, pre-literacy skills.

1. INTRODUCTION

Play-based learning is a vital component in teaching young children new ideas and helping them explore their environments (Hinske, Langheinrich, & Lampe, 2008). As a result, play-based learning is a fundamental principle of much early childhood curricula and underpins the New Zealand Early Childhood curriculum, Te Whāriki (Nuttall, (2003). Play-based learning is often used when teaching young children, the use of games, puzzles and wordplay are typically adopted as a way to teach early literacy with young children (Roskos, 2017). Modern digital technologies have been seen by some researchers as a way to better support this process. As a result, a wide range of digital tools has been developed such as play objects (e.g. Bay Einstein), multi-modal books (e-books) that adopt both text, sound and video, and video games (Roskos, 2017). The impact these tools are still being determined, however, they do highlight the potential for new ways that better engage learners in this more modern digital society (Plowman & McPake, 2013). The ability for developing new ways for children to social engage in learning that is no longer directed (without the direction of the educator) has the potential

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linear (such as is the case with traditional books) and self-to further develop learners cognitive and reasoning skills (Plowman & Stephen, 2005).

The poster presents an overview of the research carried out at Eastern Institute of Technology, Napier for the postgraduate in IT course curriculum exploring the concept of how Augmented Reality could be adopted in education to support early childhood literacy.

2. THE RESEARCH PROJECT

New technology such as augmented reality (AR), which blends reality with digital information may provide the best mix of both worlds. This mixed with game-based learning and mobile technology may help optimise learning to promote pre-literacy skills in children. As a result of this concept, a research pilot was undertaken to determine how AR could be used to support pre-literacy learning in young children. The objective of this research was to design an android based mobile AR learning application which would introduce young children to developmental concepts (such as recognition and sequencing) to determine the potential benefits this would have for supporting early literacy learning.

In particular, this study aims to explore the benefits of Augmented Reality in early childhood education. An initial prototype has been developed an AR application to support and enhance the pre-school learning experience in children. This prototype will be used to start exploring the research question of "How Augmented Reality applications can impact the motivation and interaction levels of children in their pre-school learning when they are first exposed to AR technology". The motivation behind this study is to understand the needs of the children as well as teachers and parents while utilizing the benefits of augmented reality technology to deliver learning materials in a new and more interactive way. While interacting with the 3D contents and listening to the pronunciation of alphabets and words, children can learn the phonics more easily and with enhanced enthusiasm

This poster outlines the first phase of this study and describes the prototype that has been developed to start researching this question. This project adopts a design-based research approach which incorporates many cycles of development and
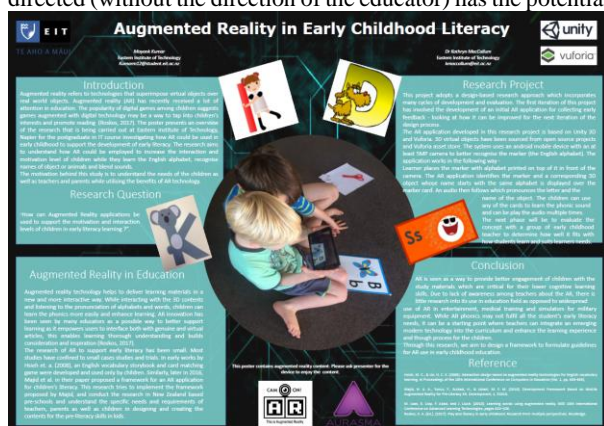
evaluation. Through this research, we aim to design a framework to formulate guidelines for AR use in early childhood education. The first iteration (and the focus of this poster) involves the development of an initial AR application and the early feedback, from the researcher and an expert on teaching literacy, on how it could be improved for the next iteration of the design process. The second iteration of the project would involve incorporating these early feedback ideas and feedback gained from the first iteration of the AR application and conduct the further evaluation with a team of early childhood educators. The next phase will be testing with children, however, this will only happen after the Ethics committee approval, the application would be made available for the children to play with and a video recording of the session would be done to collect the data for analysis post-trial.

3. THE PROTOTYPE

Augmented Reality (AR) can be characterised as the ability to enable genuine and virtual items to exist together in a similar space and can be interacted with in real time (Azuma, 1997). Virtual objects utilized as a part of Augmented Reality system may incorporate text, still pictures, video cuts, sounds, 3D models and animation.

AR applications are classified as marker-based and location-based applications. Marker-based applications incorporate 3 central components such as an object with the marker in it, an apparatus that changes the information in the marker into digital information and a display unit which screens the computerized information in 3D or 2D design (Chen and Tsai, 2012). For example, in the article presented by M. Juan (2010), an AR application has been created to help youngsters to effectively spell words by putting and adjusting the markers representing each alphabet in their right position.

In this research, marker-based AR technology has been employed.

AR innovation has been seen by many educators as a possible way to better support learning as it empowers users to interface both with genuine and virtual articles, this enables learning thorough understanding and builds consideration and inspiration (Roskos, 2017).

The adoption of AR to support early literacy has been small. Most studies have confined to small cases studies and trials. In early works by Hsieh et. a. (2008), an English vocabulary storybook and card matching game were developed and used only by children. Similarly, later in 2016, Majid et al. in their paper proposed a framework for an AR application for children's literacy. This research tries to implement the framework proposed by Majid, and conduct the research in New Zealand based pre-schools and understand the specific needs and requirements of teachers, parents as well as children in designing and creating the contents for the pre-literacy skills in kids.

The AR application developed in this research project is based on Unity 3D engine and Vuforia. 3D virtual objects have been sourced from open source projects and Vuforia asset store. The system uses an android mobile device with an at least 5MP camera to better recognise the marker (the English alphabet). The application works in the following way:

1) Learner places the marker with alphabet printed on top of it in front of the camera.
2) The AR application identifies the marker and a corresponding 3d object whose name starts with the same alphabet is displayed over the marker card.
3) An audio then follows which pronounces the letter and the name of the object.

The children can use any of the cards to learn the phonics and play the audio multiple times.

4. CONCLUSION

AR is seen as a way to provide better engagement of children with the study materials which are critical for their lower cognitive learning skills (REF). Due to lack of awareness among teachers about the AR, there is little research into its use in the education field as opposed to the widespread use of AR in entertainment, medical training and simulators for military equipment (REF).

While AR phonics may not fulfil all the student's early literacy needs, it can be a starting point where teachers can integrate an emerging modern technology into the curriculum and enhance the learning experience and thought the process for the children. AR phonics can help teachers looking for methods to engage students to reach the more cognitively challenging skill of blending sounds.

To realize the full potential of AR technology and efficient implementation in early childhood literacy learning, teachers and developers need to work together to come up with better quality of contents which meets the curriculum requirements of the institution as well as provide flexible learning contents to the children.

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