Using Augmented Reality and Serious Gaming to Enhance Learning–The Case of Primary School Education in Uganda

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I. INTRODUCTION AND BACKGROUND

Traditional education in primary schools is generally a one-size-fits-all approach with a lot of emphasis on theory and less time for practice and conceptualization of the subject matter [1] [2] [3]. This has a negative effect on children's learning ability. This paper explores the use of Augmented Reality [7] and Serious Games [8] to enhance learning. Augmented Reality (AR) technology makes it possible to interact with the surrounding real world and digitally manipulate it. Serious games are games designed for purposes other than entertainment (e.g., learning games) [9]. In education particularly, AR and serious games provide a model to develop a complementary learning platform to traditional schooling methods.

OBJECTIVES

The purpose of this research was to develop a mobile-based educational tool for primary school students using Augmented Reality and serious gaming and test and evaluate its value addition to their learning process.

SCOPE

We designed learning tool for children between the ages of five to nine (primary one to four) and incorporated specific topics in Science.

METHODOLOGY

We used prototyping, functional testing and Human-Computer Interaction testing [4] [5] [6].

IMPLEMENTATION

To realize this, we used Eclipse Integrated Development Environment, Java for Android, C++ and Qualcomm Vuforia Software Development Kit. We deployed our learning tool on a tablet computer – a mobile device with a back-facing camera running the Android operating system. Figure 1 shows children interacting with the tool to get information about bananas.

Figure 1: The main screen for the AR learning tool prototype

II. RESULTS

We tested our tool with 20 children in primary two. As such we were able to determine that even if most of them had no computer literacy skills, all of them were able to navigate through the tool effortlessly, that is launch it, interact with the dialogs and close it after receiving basic instructions from us. 19 out of the 20 children were able to articulate what they had learnt after interacting with the tool (Figure 2).
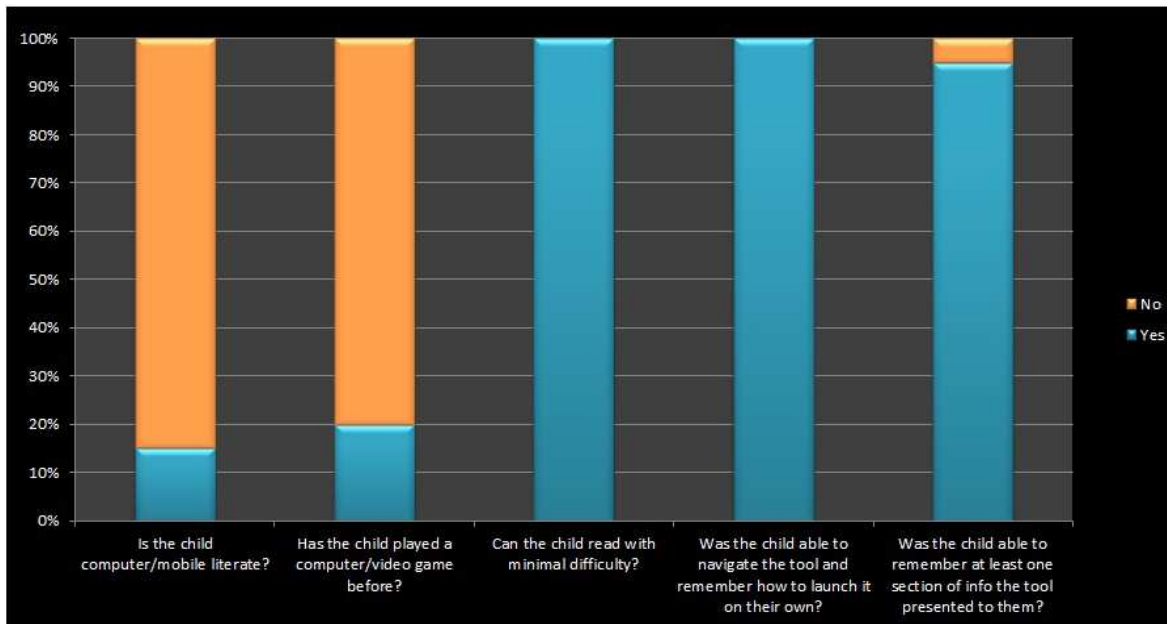
Figure 2: Results from one of the Human Computer-Interaction tests

DISCUSSION

The results revealed to us that mobile-based learning tools designed according to best practices provide an interactive and engaging learning experience to children and even if they lack prior experience with computing devices and video games, they have a high ability to learn quickly and adapt to these tools.

As part of future work we plan to carry out further research to measure precisely the effect that such a learning tool has on children's ability to learn more effectively.

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