AR-Science Magic Book Learning System

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Highlights: Students have been perceiving even simple concepts in science are particularly difficult to grasp, since many ideas involve three-dimensional thinking. So, an Augmented Reality learning tool called AR-Science Magic Book Learning System (AR-SMB) was developed to provide easy-to-use teaching/learning tools for learners and educators. The unique capability that allows virtual objects to appear in real world can serve as an effective tool to facilitate students to acquire better understandings on science and assist teachers to teach concepts that cannot be easily seen in a natural environment. Thus, AR-SMB has a bright potential for expansion and among potential markets include schools, parents and collaboration with publisher like Sasbadi/Pelangi.

Key words: *augmented reality; science; elementary school; educational technology*

Introduction

Learning science is not easy. Many of the concepts and phenomena they learn are not only new and unfamiliar, but they are also unable to directly experience it. Learning science may be crucial in early childhood, serving not only to afford opportunities for children to develop a better understanding of the world around them but also to build important skills and attitudes for learning. Even simple concepts in science are particularly difficult for students to understand, since many ideas involve three-dimensional thinking. However, much of the teaching materials used in science education are 2D in nature and there are still few targeted instructional material for science concepts is available for educators and learners. When introduced to science learning in school, many children has difficulty in understanding science concepts (Sanchez, 2014). This may cause their losing interest in the subject, which would later render their negative attitude towards learning. This issue therefore requires improvement in the learning techniques and tools used in science education. Thus there are concerns over the use of emergent technologies as a tool to facilitate students to obtain a better understanding of science. So, an Augmented Reality (AR) learning tool called AR-Science Magic Book Learning System (AR-SMB) was developed to provide easy-to-use teaching/learning tools for learners and educators. AR-SMB is an AR book-based educational tool that allows webcam to recognize pages in the book and turn them into 3D presentations to help students acquire new concepts and overtake misconceptions about science. AR can be defined as taking its' three properties into consideration: combining the real world with virtual worlds, providing interaction, and presenting three dimensional (3D) objects (Azuma, 1997). AR provides both virtual and real world simultaneously to users. AR allows users to work in the real world and interact with virtual objects that are projected on real scenes around them. This capability makes this technology an interesting resource in any type of teaching that is unachievable with the use of other technologies. In addition, appearing of 3D objects in real world creates a magical feeling causing a high degree of surprise and curiosity (Bujak et al., 2013).

There are no similar existing products in term of the design and educational principles used in the current product. The product has been developed based on educational Predict-Observe-Explain inquiry-based learning design and the cognitive theory of multimedia learning (CTML). Unlike other AR applications, which require users to wear goggles or other head-mounted display devices, this invention is used without any devices on the user's body. It only requires a laptop and a webcam to render virtual objects, small in data storage and can run on any platform ranging from Windows XP to Windows 7. AR-SMB could facilitate students to acquire better understandings on science and assist teachers to teach concepts that cannot be easily seen in a natural environment. The product also enables student-centered learning as recommended in Pelan Pembangunan Pendidikan Malaysia 2013-2025. AR also could foster student's creativity, imagination and motivation to learn. Furthermore, the product encourage students to engage in an interactive learning environment that makes learning interesting leading to improved academic results. The findings from the real settings showed that learning through AR-SMB has a statistically significant improvement on student's science performance score and visualization abilities. The amount of student-students interaction and students-AR interaction also were high indicating that they were really interacting and active in the learning activities. By visualizing the abstract concept, AR can help to teach subjects where students could not possibly gain real-world first-hand experience. Beside that, AR also allows students to manipulate the 3D virtual objects from a variety of perspectives to enhance their understanding by just using their bare hands. This friendlier interface allowing users to use their hands to manipulate the visualizations rather than clicking and dragging the mouse which body movement helps people remember what they perceive and provides a cue for future recall.

AR has a bright potential for expansion because of its affordances. Therefore, we can commercialize the product to all school since the subject content of the product was based on science syllabus. Among potential markets include schools, ministry of education, teachers, parents and collaboration with publisher like Sasbadi/Pelangi.

References

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