Supporting e-Learning Platform Using Radio Frequency Identification (RFID) For Preschool Children

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Abstract

Today, with the advancement and proliferation of information technologies (IT), researchers have taken a step on how to develop e-learning platform more powerful and practicable for preschool children learning. It is common for preschool children to interact with dozens of digital devices. Furthermore, learning begins from the concrete to the abstract. This paper introduces a combination of e-Learning environments and tangible interface approaches for preschool children learning. Children need real experiences, which interact with concrete objects in building of knowledge. One of the techniques that has been successful in bridging connections between the physical and virtual environment is Radio Frequency Identification (RFID). The aim of this research is to design and evaluate the Children's Storybook Reading System (CSRS), which implemented by using storybook, computer-based and RFID. Using this attractive CSRS, they can nurture the learning using RFID technology. Pilot test was conducted and results showed that the system can rapidly increase children interests to have interactive and active learning environment.

Key words: Children's Storybook Reading System (CSRS) e-Learning, Radio Frequency Identification (RFID), Storybook and Preschool Children
Introduction

The development and evolution of information technologies over the past decade has led to new way changes in e-Learning. e-Learning means the delivery of a learning, training or education program assisted by information and communication technology (ICT) (Shen, Callaghan, & Shen, 2008). Learning as a process of acquiring knowledge, technique, attitude and value through instruction and experience (Wei, Hung, Lee, Chen, & 2011). Therefore, a suitable learning environment with proper learning sequence is essential for learning, especially for preschool children who are still in the early development period.

Preschool children learn by exploring their surroundings and based to Piaget’s formal operational stage, children need concrete, hands-on experiences (Marshall, 2007) rather than abstract concepts to support more natural learning, developing, and thinking. Fun and enjoyment are also well known to be effective in children’s development, both supporting and deepening learning, as well as facilitating engagement and motivation. Affective learning is an important aspect of education (Li, Hu, Zhu, Yan, & Zheng, 2009). However, traditional computer interactions cannot support these principles and do not provide the type of direct contact most familiar to preschool children (Sung et al, 2007). A technique that has shown potential in bridging connections between the physical environment and virtual artifacts is radio frequency identification (RFID) (Becky Sue Parton & Hancock, 2008). Nowadays newly invented technologies like e-learning and RFID solution are expected to improve ‘transfer-of-learning’ with ‘real-world’.

Technology in e-Learning

In the last decade, e-Learning has been introduced to a variety of learning scenarios. In learning scenarios the learner’s situation is an essential asset in designing the learning process. Recent research suggests aiding the design process through the use of tangible technology approaches. Tangible technology is a term that refers to directly linking computer-based activities with real-world physical objects and events (B. S. Parton, Hancock, & DuBusde Valempré, 2010).

According to Piaget’s formal operational stage, tangible computing offers a more concrete approach to digital learning and exploratory play. Traditional computing environments particularly do not support call for extending these approaches. RFID tags can be embedded into almost anything and can subsequently be used to trigger rich multimedia presentations. As a result, a small handful of prototypes that integrate with RFID technologies have been developed to facilitate...
tangible interaction for preschool learning process. Our research team developed a solution by combining a storybook that embedded with RFID tags.

e-Learning is the use of telecommunication technology to deliver information for education and training. With the progress of ICT development, e-Learning is emerging as the paradigm of modern education. e-Learning means the delivery of information for education, learning or training program assisted by ICT (Sun, Tsai, Finger, Chen, & Yeh, 2008). e-Learning involves the use of a number of technological tools that can be applied in various contexts (Nichols, 2003). A common theme explored in e-learning literature is on how technology plays the role in changing the learning paradigm, which resulted the process of acquiring knowledge become faster and more efficient. Such of the technology is using techniques (Mentis, 2008).

Storytelling is the process of creating narrative structures in children’s life (Franca Garzotto, Paolo Paolini, & Sabiescu, 2010). In early childhood, storytelling is a means to support children’s development, to help them express and assign meaning to the world, From primary to high school, storytelling activities are proposed to students in order to improve their linguistic and literacy skills, and to foster their ability of interpretation, analysis, and synthesis (Franca Garzotto, et al., 2010).

Compare with the other e-learning systems, the RFID system will transmit the identity of object or item wirelessly using radio waves. This will enable data to be transmitted by a portable device or object and via versa. RFID was applied in different approaches to enhance the system (Wong, Ho, Yang, & Kwok, 2011). Combination of e-Learning activities with real physical activities and even helps to better understand and structure our approach of integrating learning experiences into storytelling book. The physical reality is the storybook and integrated with RFID. The imaginary reality is the children’s imagination and the story that unfolds in their mind. Traditional storybooks would only consist of these two realities.

Problem in learning process

There are four factors contributing to the issues faced by kindergarten teachers to enhance and motivate learning process.

The first problem is slow learning received by kids. The development of useful learning assistance systems has become a common research topic in past few years (C.J., Liu, & K.E, 2010). The introduction of an interactive learning tool will act as a basis for kids to develop their own skills and knowledge, and will encourage kids to voluntarily spend their time for learning process and speed up the learning process (Hsi, 2007; Lampe & Hinske, 2011). Integrating the technologies and multimedia’s elements, can foster the kids approach toward the learning process. In addition, it is served as an important function for psychological and social development of the kids (Kahl,
The second problem is passive learning. The passive learning is the traditional way for educator or teacher to disseminate the knowledge to the kids via communication and physical approach. The kids will listen and try to give feedback based on instruction from their teacher. Throughout a cognitive approach, students will actively involve in the investigation of a specific science’s problem. One of the potential ways to initiate a cognitive approach, we can use an interactive learning to spark and motivate student interest in learning the science. This will result the transformation of the learning process from passive to active learning (Bork, 1980).

The third problem is lack of support for creativity and inspire kid learning process. Human intelligence development is affected by the inborn conditions and acquired contexts since childhood (Wei, et al., 2011). The learning process consists of several steps, and time requires to reach each step is different for each kid. As a result, the new learning environment is required to assist and speed-up the kid learning activities. Using technologies such as RFID (Wei, et al., 2011) and storytelling with multimedia features (Di Blas, Garzotto, Paolini, & Sabiescu, 2009; Kahl, et al., 2009), will increase learners’ motivation and offer a more joyful perception to learners (Wei, et al., 2011).

### Implementation

In the implementation part of the system, each module in the development of Children’s Storybook Reading System (CSRS) System are discuss in details. Figure 1 shows the main interface in this system. Children can click ‘masuk’ (enter) to start the learning session.

![Figure 1: Enter and exit interface of the CSRS](image)

After children clicked ‘masuk’ (enter) in the main interface. Menu interface appeared. The children can choose to learn ABC, learn syllable or read the storybook. In the second activity, the children put a syllable card inside the storybook that they do not know how to pronounce the word. They put the card on or close to the reader. On the screen it will display the syllable, spelling and pronunciation of the words as shown in the Figure 2.
Then, when the children press on the button of ‘Membaca Buku Cerita’ (reading storybook), CSRS will read the story automatically and display all the interactive multimedia such as picture and sounds. The children can also refer to the storybook provided to read the entire related story manually. Then, after the children read the book, they click next. Figure 3 shows the sample of the storybook and exercises.

The children may answer the questions regarding the given story. The children use the answer’s card provided in the storybook to choose the right answer. If the answer is true, popup right answer will be displayed and vice versa. Figure 4 shows popup menu for the right and wrong answer.
Pilot testing results

Teaching and learning using RFID will help children to enhance interactive and fun learning environment because it’s needs the children to move their hands, eyes and other senses. Results showed that it is important to create a great and nice interface, attractive book using the cute cartoon and colorful background. In addition, it uses the audio to read the book, read the letter and spells the word. Furthermore it will be able to attract the children indirectly to use this CSRS. Taska Noorni (Noorni Kindergarten) in Pulau Rusa village, Kuala Terengganu, Terengganu was chosen as respondent in pilot testing. We set up the CSRS at this kindergarten to the 10 kids from age’s four to six. Their teachers briefed the children about the CSRS and how to use it. Figure 5 shows the teacher use storybook to teach children and children place the card near the antenna. They would also look at the computer monitor to see the presentation with excited. The children like the system and use it with the curiously and interest.

Figure 5: The teacher use storybook to teach children and one of the children place the card near the antenna

In addition, the teacher gives positive feedback on the CSRS. Firstly this system is very interesting and suitable applicable for enhancing children learning process. Secondly, they see their students are enjoyed, very excited and concentrate on the learning activities when learn with the system.
Conclusion

The aim of this research is to design and evaluate a prototype CSRS using RFID technologies. This system has been developed based on its three objectives. Firstly to study the manual children’s storybooks system based on RFID. Secondly to design and develop the children’s storybooks system based on RFID and lastly to test the functionality of the children’s reading system. The results showed that the CSRS project can increase kid’s learners to have better learning experiences and active learning. The teachers responded that the CSRS could increase their student learning motivations and help them concentrate on the instruction and learning activities. However, future research should consider conducting a long-term experiment to investigate the effects of learning performance.
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References


Shen, L., Callaghan, V., & Shen, R. (2008). Affective e-Learning in residential and pervasive...
computing environments.

