Hayashi, Y., et al. (Eds.) (2017). Workshop Proceedings of the 25th International Conference on Computers in Education. New Zealand: Asia-Pacific Society for Computers in Education

A Preliminary Study of Implementing an Interactive Learning Game Story Book Mobile App on Science and Technology for Primary School Students

Meng-Yu TSAI[a], Shelley Shwu-Ching YOUNG[a*] & Jun-Ming SU[b]

[a]*Institute of Learning Sciences and Technologies, National Tsing Hua University, Taiwan*
[b]*Department of Information and Learning Technology, National University of Tainan, Taiwan*
[*]scy@mx.nthu.edu.tw

Abstract: The e-storybook design pattern nowadays is generally for single user's reading that's lack of social interactions with limited fun. Therefore, to get this situation improved, in this study, we intended to develop an App called Social-based Interactive Learning Game Story Book mobile system for primary school students. Its domain knowledge focuses on Science and Technology. Through personification design the system affords reading, learning, games, and with a concentration on social interactions. For example, the personalized plants could play with readers in the story context so that children could learn the domain knowledge and apply the learned plant-related knowledge into daily life for problem-solving by means of the designed plot modules that make children cooperate with peers and parents for actively creating photos, videos and paintings, and so forth for establishing their portfolio and sharing as well so as to promote children's reading motivation and fun of reading, Moreover, students can develop the ability to interact with others for solving problems. Usability test was conducted to 35 participants and the overall feedback is positive. In addition, some constructive suggestions for interface design and some minor improvements have been given by the participants for refining the system. After further modification, the system will be integrated into the actual leaning contexts of the elementary schools. We hope the App will bring fun in learning by doing and actions and an innovative interactive reading mode will be developed.

Keywords: Game-based learning, inquiry learning, e-storybook, social interaction.

1. Introduction

Reading is the basis of learning. It is not easy for children to learning something without good reading abilities. So the story reading abilities have been played an important role in the learning process of primary school students (Goodman, 1996). The purpose of reading is to develop the habit of reading, finding problems and solving problems rather than learning advanced knowledge. In recent years, the storybooks have been shown in variety patterns by the development of mobile technology. It is easier to describe the abstract concepts of stories in multimedia devices than general texts. Due to the importance of reading abilities and the mobile technology, we developed an App called Social-based Interactive Learning Game Story Book Mobile System for primary school students.

The multimedia story books have been widely used on mobile vehicles to increase the richness and fun of reading. For examples: Nuclear solution, Farm Summer, The Fantastic Flying Books of Mr. Morris Lessmore and Spray. These samples attract children's attention through the images, the sound, the animation and the multimedia effects. However, there is still something insufficient of the current e-storybook needs to be improved. For examples: 1. Interactive story content: The general e-storybook is lack of interaction between readers and storybook. 2. Social-interaction story content: The traditional story is kind of reading process without the interaction and cooperation. 3. High-level thinking ability: Reading is the target of the traditional design of story books. The traditional design is

lack of high-level thinking abilities training such as scientific inquiry and problem-solving abilities. 4. Diverse story reading experience: The reading experience of traditional storybooks is fixed.

Therefore, in order to improve the design of the existing multimedia story books. We have developed an APP called "Social-based Interactive Learning Game Story Book" based on Science and Technology for primary school students. This project includes four design features: 1. Game-Based Story Reading 2. Diversified Interactive Task 3. Social-Based Interactive Tasks 4. Diversified Reading Experience. The story content is based on the subject of Science and Technology. Young readers find problems, explore problems and learn to solve problems through two-way interactive tasks between the reader and the mobile. In addition, we add social elements in the system in order to increase the interaction and interest in the APP context. We improve the traditional single-reading model and establish emotional contact and communication with family or friends. Readers will create their own story after completing all the tasks. The storybook will be full of readers' creations which are made from interactive tasks or social tasks.

2. Literature review

2.1. Game Based Learning

Learning is often tedious, so how to arouse learners' motivation is an important part of effective learning. Motivations are divided into intrinsic motivations and extrinsic motivations by external incentives and their own interest. And intrinsic motivation is often superior to extrinsic motivation. The game is a good way to improve learners' intrinsic motivation. The interaction and exploration of games make learners' motivation enhance easily. The traits of games are good for improving the acceptance-passive knowledge of traditional learners (Bruner, 1966). The main purpose of the game-based learning is to achieve the desired learning goal by improving the learners' participation and enhancing the persistence elements (Malone, and Lepper, 1987). Psychology experiments have found that the multiple sensory learning model will stimulate the brain excited and provide good learning conditions so that learners achieve their learning objectives. As with supplementary teaching in the classroom, game-based learning is one of the ways to effectively stimulate learners' motivation to enhance the concepts, techniques, and knowledge (Prensky, 2007). Learners are willing to participate in learning and develop the ability of discovery, analysis, problems solving and concept construction. The balance between entertainments and learning has become the main problem of Game-Based Learning.

2.2. Inquiry Learning

The first concept of Inquiry Learning was made by American philosopher and educator Dewey (1963), who argued that learning should be centered on learners. Learning is the process that learners take the initiative in observation, thinking and prediction (Krajcik, Czerniak & Berger, 1998). In recent years, with the reformed science education, inquiry learning has become the core of science education. The context of the actual life is helpful for learners to find each link in the teaching context. It is good for learners no matter that the answer is correct or wrong. The wrong answer is much better for learners than the correct answer. Bruner（1996）made the learning theory, which emphasizes that the primary purpose of learning is not to get knowledge but thinking and inquiry. The theory of inquiry learning supports is that learners make solutions by their own rather than receiving answers from others. Learners should corroborate own solution by observation and inquiry (Trowbridge & Bybee, 1990).

3. System Implementation

3.1. System Architecture

In Figure 1, the system structure is composed of the front-end mobile system and back-end cloud database system. The front-end system consists of a registration module, a social interaction module, a story reading module and an interactive task module. The back-end cloud database system consists of a user database, a task database and a friend database. By integrating these two systems, the user's data will be linked and synchronized. These two systems also maintain the fluency of the game and form a social interactive learning game.

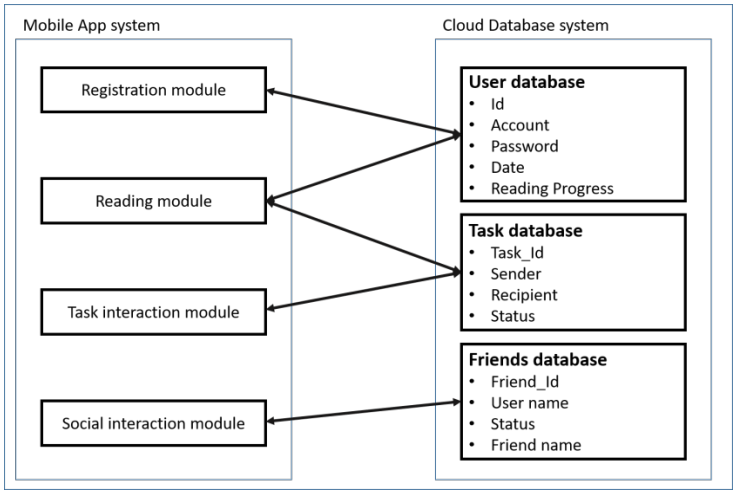

Figure 1. System structure

3.2. System Design

There are four particular designs integrated in the system. 1. Game-Based Story Reading. 2. Diversified Interactive Task. 3. Social-Based Interactive Tasks. 4. Diversified Reading Experience.

- Game-Based Story Reading： The interactive tasks are interspersed in the story content. The game-based content design is easier to enhance readers' reading motivation than the traditional story content. In Figure 2, the painting game “drawing the radish.” In Figure 3, readers will find the main cause of the plot changing is the water pollution. Readers have to find out the garbage and recycle the garbage to continue the plot.

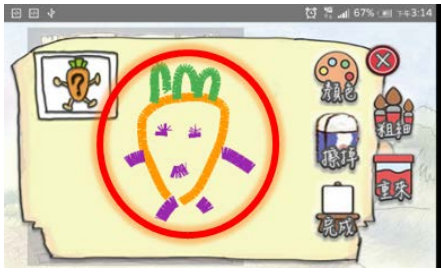

Figure 2. Drawing the radish

Figure 3. Recycling task

- Diversified Interactive Task：We used the mobile devices’ multimedia features to design the diversified interactive tasks which are combined with the storybook content. In the design, the system will collect readers’ works which will be shown in the story content. The Figure 4 and the Figure 5 are photo task and recoding task.

Figure 4. Photo Task

Figure 5. Recording Task

- Social-Based Interactive Tasks：Readers solve the social-based interactive tasks of the story plot via sending video or receiving photos. The social-based interactive design makes readers increase interaction between each other. In Figure 6, readers send friends a task invitation. In Figure 7, the readers received a video from friends.

Figure 6. Send Invitation

Figure 7. Receive a Video Message

- Diversified Reading Experience：Users will create their own stories by paintings, photos, videos, and recordings. These user-generated contents (UGC, 2016) will be presented in the stories. After completing the reading, different readers will have different e-storybooks and different reading experiences. In Figure 8, the photo was which took by the reader shown in the story content. In Figure 9, readers can review videos which received from previous task.

Figure 8. Story Content with Reader's Photo

Figure 9. Memories Page

4. Evaluation

4.1. Test Design

Because the system is currently in the early stage of development, so we sought volunteers who are interested in the areas (e-learning and information technology education) to test the system in order to determine whether the system was good to be integrated into the actual teaching. 35 volunteers participated in this study, including 23 teachers and 12 graduate students. The teachers were of age 30 to 50. The graduate students were of age 20 to 30.

We collected feedback from the 35 users after the test. First, we introduced the research origin and the purpose of the system to the users, and assisted users to create an account and start the test. We played a role of the user's friends or parents to help users complete the social cooperation task in the story, during the process of the test. After the test, we had a meeting with the users. The meeting was mainly for the use of the system on the issue or recommendations. The collected questions and suggestions are divided into three parts: system content, system interface and system function.

4.2. Result and Feedback

The overall feedback is positive and we also acquire some suggestions for improvement. The collected feedback and suggestions are divided into three parts: system content, system interface and system function. In terms of system content, most of participants gave us some suggestions to make the content richer and diverse. We can make the learning content more diverse by combining with different subjects. In the system interface part, the system should increase system feedback and notification. Because the target users of the system are primary students, so the number of words and picture style should be adjusted slightly. System function suggestions are all about additional features such as the talking function and the light detect function.

5. Conclusion and Future Work

In this study, we developed an APP called “Social-based Interactive Learning Game Story Book”, which combines reading, learning, game and social interaction. The app improves the user’s motivation of reading and makes learners learn the plants and pollution knowledge. The system had been tested by 35 participants, who had an interview with us after the user completed the use of the test. The interview results are positive. After the system being tested, the system is still needed to be partially modified and strengthened to meet the students' needs. After further modification, we hope the system will be integrated into the actual leaning contexts of the elementary schools. We hope the App will bring fun into learning by doing and actions and an innovative interactive reading mode will be developed.

Acknowledgements

Thanks for the support from the Ministry of Science and Technology (MOST), R.O.C., under the grant code: MOST 105-2511-S-007 -002 -MY3.

References

Bruner, J. S. (1966). Toward a theory of instruction. New York: Norton.

Dewey, J. (1963). Experience and education. New York: Collier Books.

Dillenbourg, P. (1999). What do you mean by collaborative learning. Collaborative-learning: Cognitive and computational approaches, 1, 1-15.

Goodman, K. (1996). On reading. USA: Heinemann

Krajcik, J., Blumenfeld, P. C., Marx, R. W., Bass, K. M., Fredericks, J., & Soloway, E. (1998). Inquiry in project-based science classrooms: Initial attempts by middle school students. The Journal of the Learning Sciences, 7(3&4), 313-350.

Malone, T. W. and Lepper, M. R. (1987). Making learning fun: A taxonomy of intrinsic motivation for learning. Aptitude, Learning, and Instruction: Cognitive and Affective Process Analyses, 3, 223-235.

Prensky, M., (2007). Digital Game-Based Learning, New York: McGraw-Hill.

Squire, K. (2005). Game-based learning: An X-learn perspective paper. MASIE center: e-Learning Consortium.

Trowbridge, L. W. & Bybee, R. W. (1990). Becoming a Secondary School Science Teacher (5th ed.).New York: Merrill.

UGC (2016). User-Generated Content. Retrieved from: https://en.wikipedia.org/wiki/User-generated_content. of Physics. 66(1), 64-74.