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# Explore Teaching Effectiveness of Digital Game-based Learning System in Primary School Social Field Curriculum

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**Abstract:** Although many scholars have proposed a digital game-based learning system and applied it to different fields, there is less emphasis on its use in the courses of social field. Therefore, this study proposed a digital game-based learning system that combines multimedia technology and game mechanisms, focusing on teaching activities in the social field, assisting learners in reviewing Tamsui's development history, and guide the learner to understand the story about the land of Tamsui. In order to verify the learning achievement of the proposed system, this study took the fourth grade primary school students as the experimental subjects, and randomly divided the students into the experimental group and the control group. Through the experimental results of this study, it is found that the control group's performance in terms of learning achievement was higher than that of the experimental group, but in terms of learning motivation and learning behavior, the experimental group's performance was better than the control group. It is expected that this study can be used as the reference data in future game-based learning in the social field of elementary schools, which are then used for education promotion.

**Keywords:** Digital game-based learning, Social Field, Teaching Affect

## 1. Introduction

Many scholars have integrated the means of games into the context of education through multimedia technology, and have proposed related game-based learning systems (Chen, Tsai & Chang, 2016; Prensky, 2001; Boyle, 2016) , which has formed a trend in the fields of mathematics, natural science and English (Tsai, Yu & Hsiao, 2008), less is focused on the courses of history, geography or other social fields (Lai & Peng, 2015), and the teaching of such courses often constructs teaching contexts of many different national cultures or story backgrounds, while teachers can usually only supplement with video or photo explanations to improve learners' understanding. However, it is not only abstract and difficult, but also makes the learner lose confidence in learning and have a sense of frustration to imagine the pictures of various periods and the changes of each century based only on the information of these fragments (Chiou, 2017). Therefore, there are still many topics worthy of in-depth discussion on the educational effectiveness of introducing game-based learning systems into the social field curriculum (Shih, 2013).

Based on the above, this study proposed a learning system that combines multimedia technology and game mechanisms, and takes the content of the hometown's place name and location as the main axis, with a game-based way of walking Tamsui's history to introduce Tamsui's historical background. This kind of immersive game environment allows elementary school children to learn the knowledge imparted in the game naturally by responding to the game plot, thereby improving the learning motivation of the elementary school children, who are willing to take the initiative to learn to achieve the improvement of learning achievement; in addition, this study used a random grouping method, by which the students were divided into the experimental group (the learning group using game-based learning) and the control group (the learning group not using game-based learning) for the

after-class review work. The impact of the use of game-based learning system on the learning motivation and learning achievement of elementary school children was understood via implementing pre-test, post-test, questionnaires, interviews and observations, and in-depth discussion was made on whether this learning method can really bring about changes in learning.

## 2. Mackay Adventure System

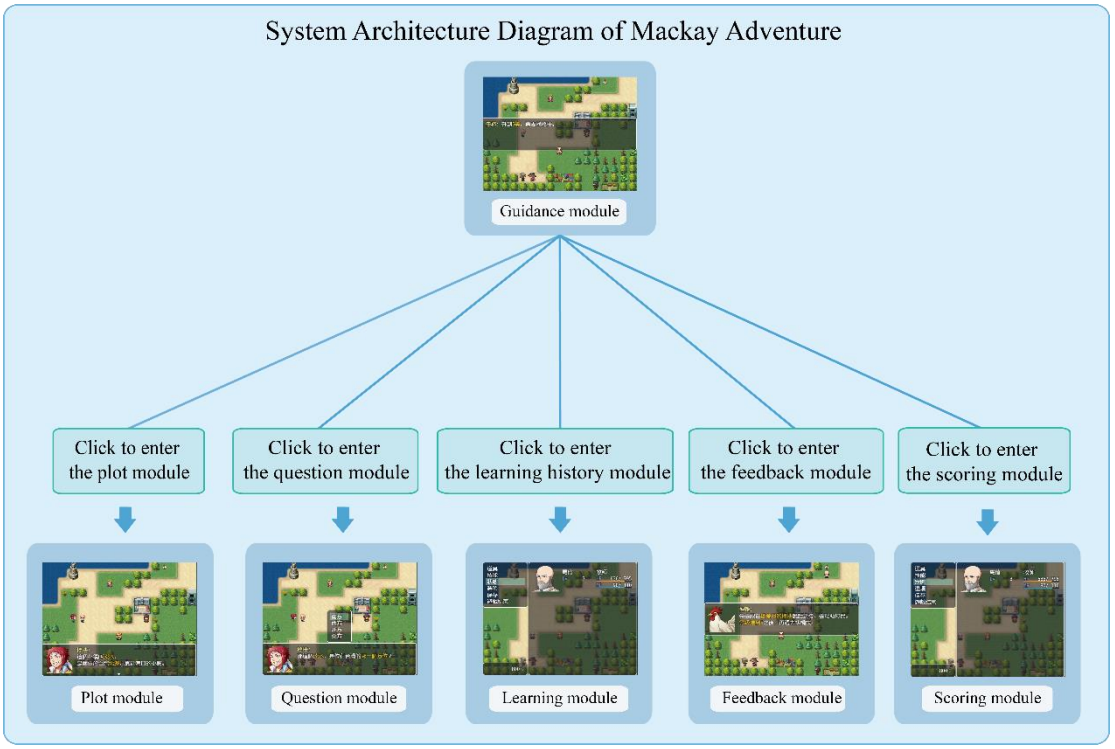


*Figure 1* System Architecture Diagram of Mackay Adventure

Figure 1 is the system architecture diagram of the Mackay adventure, including the guidance module, plot module, question module, learning history module, feedback module and scoring module. The guidance module at the beginning of entering the game will show the learners the tasks to be completed and the learning goal to be reached. Five kinds of menus are provided in the guidance module: the first kind is the plot menu, introducing stories or events about the region; the second kind is the question menu to ask learners to answer the questions and get scores for correct answers to go to the next level, otherwise learners will lose points and stay at that level until they can proceed to the next level with enough correct answers; the third kind is the learning history menu, with which one can view the current learning progress to understand the present learning status; the fourth kind is the feedback menu to recommend the level suitable for the learner according to the learning situation and help the learner to review more efficiently; the fifth is the scoring menu, where the learner can see the his or her scores of learning at any time to master the current state of learning.

## 3. Experimental Results

### *3.1 Analysis of Learning Achievement*

Before the experiment started, the average pre-test score of the experimental group was 66.29 (*SD*= 8.07); the average score of the control group was 64.77 (*SD*= 16.07). The *t*-test analysis results showed that the significance of the total score of the two groups was 0.67, which does not meet the significant standard. After the end of the experimental activities, the average post-test score of the experimental group was 67.08 (*SD*=9.99); the average score of the control group was 80.65 (*SD*= 7.27). The *t*-test

analysis results showed that there was a very significant difference between the experimental group and the control group, indicating that the initial knowledge of the experimental group and the control group was similar before the experimental activity, but there was a significant difference in post-test, and the overall performance of the control group was higher than that of the experimental group. In addition, the Cronbachs'α value for the reliability of the research test paper was 0.76, which means that the reliability of the test paper in this study has reached above the average reliability level.

### *3.2 Analysis of Learning Motivation*

In the overall ARCS motivation questionnaire, Satisfaction had the highest score among the four motivations, with a total average of 4.33 (SD= 0.80). It can be seen that most learners liked to learn through games and felt satisfaction from the system; Confidence was the lowest score among the 4 motivations, with a total average of 3.73 (SD= 0.80). This indicates that learners were less confident in using this system to review geography and history courses, but since the average of the highest score and the lowest score differed by 0.6, there was not much difference between the two.

## Conclusion

This study introduced a set of Mackay adventure system, which is used in the primary school social field to teach Tamsui history and geography. The experimental results of this study show that the learning achievement of the traditional learning review group was higher than that of the digital game learning review group. However, in terms of learning motivation and learning behavior, the digital game learning group performed better than the traditional learning group. Through the analysis of questionnaire surveys and in-depth interviews, it is found that the difficulty of the game content will affect the level of learning achievement, and too difficult content will make the learner appear to evade learning, thus leading to a decrease in learning achievement, which is also same as the research results of Tsai et al (2008). In summary, this study believes that the difficulty of game content will affect whether learners will have the behaviors to avoid study, and finally affect the overall learning achievement.

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