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Learning Traditional Thai House through Gamification Based with 3D Virtual Application

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Abstract*: *Traditional Thai house, called "Ruean Thai", is a local wisdom in Thai architecture which is unique style in Thailand and it is very important and valuable knowledge to be passed from generation to generation. However, with the massive changes of latest technology, children or young people pay less attention to Thai wisdom and culture. Therefore, this research aims to preserve the Thai wisdom and cultural learning in Thai house by using gamification techniques and Thai house models in three dimensions to solve the above problems. This Thai house game application is a game based learning program to assemble Thai house models in three dimensions for entertainment and learning about the components of Thai houses of each region. In our project, students interact with a Thai house game application based gamification technique and able to learn and take challenges through gaming to expand and test their knowledge. The result shown that using Thai house game application enhances a more comprehensive understanding and engage student to raise their time learning and enjoyment during the experimental process.

Keywords: Thai house, Ruean Thai, cultural learning, gamification technique, Virtual Technology.

I. INTRODUCTION

The traditional Thai house is unique and has a charming way in architecture employed throughout the different regions of Thailand. Thai houses in each region of Thailand have different unique styles that reflected the life-style of people, culture and religious traditions. Thailand is located in the warm and humid tropical area therefore the characteristics of Thai houses in every region are designed with a high roof style to allow the wind to pass through. The construction of Thai houses is different from the current home building. Thai houses use a spur to hold all the components of the house together and the components of Thai houses will have a specific name for each part. Nowadays, Thai house has been decreased because the materials for building a traditional Thai house are minimal and technicians, who have knowledge in building Thai houses, are especially rare.

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Furthermore, with the rapidly changing environment and society, it means to impact on a decrease in popularity of traditional Thai houses and leads to make a problem of learning about the culture and

Thai uniqueness. With the advancement and development of 3D virtual technology, technology plays an important role in our lives therefore, the use of multimedia technology supports to learn and promote cultivate understanding and preserve culture. Gamification is the significant learning technique that uses of gaming mechanics to motivate and create encouragement in learning for students and learners will be occurred behavior checking, improving and finding approaches to solve problems [1]-[2]. This researcher recognized the importance of conservation by implementing the application based on gamification to assemble the Thai house model in three dimensions to solve the problems mentioned above. The game application enhances learners to learn the components of Thai houses of each region.

II. OBJECTIVES

1. To develop the effective of the Traditional Thai House Application through Gamification Based with 3D Virtual Application on the criteria of 80/80.
2. To compare the pre-learning and post-learning achievement of students who had applied the Application.

III. RESEARCH METHODOLOGY

This section explained the details of the methodology and software development through system analysis and program development by using various approaches.

Gamification is an educational technique to motivate students to participate in learning in a fun way by using the game design and mechanics elements in learning environments mechanics [3]-[4]. Gamification is the use of game mechanics to organize activities that affect students in terms of motivation, retention and academic achievement. Buckley and Doyle [5] shown the result of engaged students by using the online gamified learning is the positive impact on learning outcomes and the retention of student learning was continued when bringing the game to apply in mathematics learning [6]. The academic achievement increased when conducted gamification in study [7]. According to Mowafi et al (2019), using gamification for learning skill in numbers and counting influenced the learning experience of preschool children [8]. The game based learning was applied to learn Physics through mobile platform and this system supports teachers in handling and managing their course [9].

To engage and motivate learners, gamification enhances the performance of teaching and learning to persuade student behavior and learning outcomes [10]-[12].

Prototyping model is one of the significant Software Development Life Cycle Models (SDLC model). It will not develop the entire system quite at all but it offers a small scale which consists of various parts of the new system. Users try to use and give suggestions for further improvement in this prototype. This process is repeated until the user accepts the system. Therefore it will develop the model to be fully developed. The steps of the prototyping method are as follows: determining user requirements, developing the prototype, testing and assessing the prototype and customizing the prototype according to the user's opinion and suggestions [13].

This research is a semi-experimental research (Quasi–experimental Research) that has a Group Pretest-Posttest Design. The population and sample group of this research were 20 learners who had applied the Thai house game application. The Purposive Sampling, Semi-Structured Interviews and Keyword were used as the research method. The population of this research was the primary students of school which had the computer devices to link with the information technology.

The Thai house game application was the experimental research as shown in Table I.

Table I. Experimental Method

Group	Pre-test	Treatment	Post-test
R	O_1	T	O_2

R represented to the experimental group
O_1 represented to the pre-test
T represented to the experimental process
O_2 represented to the post-test

This research had conducted the data analysis as following;

1. Analyzed for finding the efficiency of the Traditional Thai House Application through Gamification Based with 3D Virtual Application on the criteria of 80/80 (E_1/E_2).

$$E_1 = \frac{\frac{\sum x}{N}}{A} \times 100 \quad (1)$$

If E_1 represented to the efficiency of learning process

$\sum X$ represented to the total score of learners from doing activity

A represented to the total score of activity

N represented to the number of learners

$$E_2 = \frac{\frac{\sum F}{N}}{B} \times 100 \quad (2)$$

If E_2 represented to the efficiency of achievement

$\sum F$ represented to the total score of learners from doing post learning test

B represented to the total score of post-learning test

N represented to the number of students

2. Analyzed the satisfaction of learners who had applied the Traditional Thai House Application through Gamification Based with 3D Virtual Application to enhance the educational proficiency of learners by Mean and Standard Deviation.

IV. SOFTWARE DEVELOPMENT

This section describes in detail how to develop the software application. The system requirement is the first step to implement the application and assembling a Thai house model is needed for future generations to study and learn about Thai homes. The researcher studied the principles and techniques of creating games from related documents for creating and developing games. The next phase was to design content presentation and content structure. The research was applied the gamification mechanics by using the points and level system so that participants can see their progress when answering the score and participants allow to see their progress and information. Also, the game has a competitive system to encourage participants completing the mission as the target.

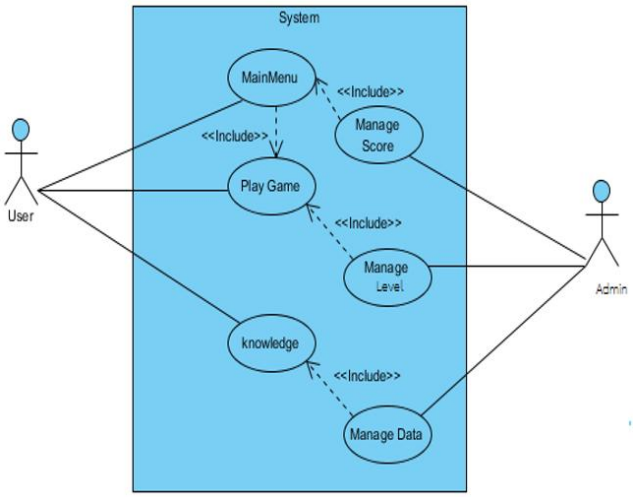

Fig 1. Use case diagram of the application

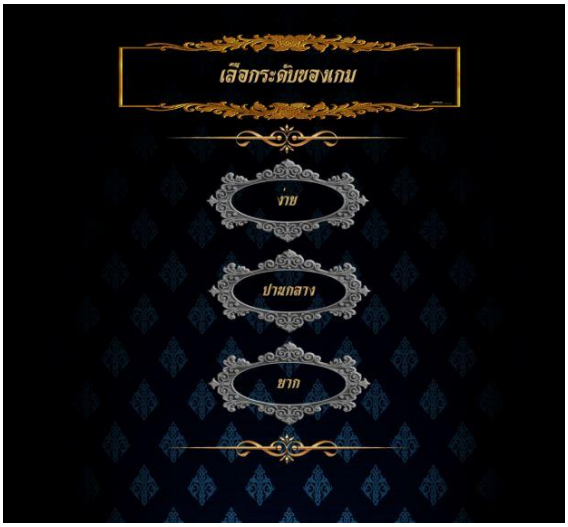

Fig 2. The example page to select level

User must select the menu of the game system and in the next step the application allows the player to choose the level of the game to play and they can exit the game to select a new game level or play until the end of the game.

Fig 3. The example page to select *Ruean* Thai home

Fig 4. The example page

The system consists of the model assembly system, the rating system, and the knowledge level measurement system as shown in Fig 2-4.

V. EXPERIMENTAL RESULTS

The research results can be divided into 2 parts which are the academic achievement and the results of the satisfaction analysis of the learners with the application program as follows:

A. The academic achievement on the criteria of 80/80

The game application was divided to be 3 levels, which are easy, medium and hard. There are quite a few players with the ability to play the game and learners have a few knowledge about the components of Thai houses. The scores from the pre-test (E1) has an average of 80.63 and the result of the post-test (E2) has an average of 81.92 which is higher than the specified criteria of 80/80.

Table II. Finding Efficiency of the Traditional Thai House through Gamification Based with 3D Virtual Application (E1/E2)

Test	Percentage
Pre-learning (E_1)	80.63
Post- learning (E_2)	81.92

The E1 / E2 efficiency equals to 80.63/81.92 which is more than the specified criteria 80/80, indicating that the lesson is effective. The samples were tested before the learning and after the training and the results were compared the differences from the tests as shown in Table III.

Table III. The efficiency of the academic achievement

Test	N	$\overline{x}$	SD	T-test
Pre-Test	20	9.92	2.96	18.71
Post-Test	20	21	3.16	

Taking the test scores before and after the training to calculate the t-test found that the achievement after the training was significantly greater than 0.05.

B. The results of the satisfaction analysis

The research evaluated the satisfaction of the samples by using the satisfaction questionnaire to find satisfaction as presented in Table IV.

Table IV. The results of the satisfaction analysis

Assessment Topic	Mean (X)	Standard Deviation (SD)	Result
Fun and interesting learning activities	4.17	0.65	High level
Suitability in using font color	4.07	0.58	High level
Appropriateness in creating game scenes	4.37	0.56	High level
Appropriateness of the game level.	4.13	0.73	High level
Appropriateness of the composition on screen.	4.27	0.58	High level
The ease of entering the game	4.27	0.69	High level
The content is clear and easy to understand.	4.20	0.61	High level

The table IV shows the results of the assessment of the satisfaction of the system was 4.08 in average and 0.41 in SD and high level of satisfaction.

VI. CONCLUSION

Gamification is applied in teaching and learning activities by adhering the guidelines for creating fun challenge to play a game in which a player has to both lose and win with most games having a reward as an incentive.

The results show that using gamification technique can increase the interest in learning at a higher level and the students were satisfied with using Gamification at the highest level. Also, Gamification can motivate students to have higher attendance and motivate learners to participate in the class both to answer questions and to do more classroom activities.

The sample group had positive attitudes towards game learning management. However, in term of the future experiments, we suggest that there should be an experiment with multiple groups in order to compare the results between the groups. Furthermore, the application supports only the Android operating system so to increase the channel of participation of those interested in participating, therefore, other operating system should be developed for support as well.

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