The usability of the educational board game for learning English

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Abstract. English is the most widely spoken language in the world and used as an international communication. The importance of English proficiency is the primary reason for people to be motivated in English learning. Such learning process requires a learning facility to help achievement the learning goals. One of the English learning facilities is board game which has been developed in the previous study. However, the usability of this board game design as media in teaching-learning process remains unproven since it needs a reliable testing. This study aims to analyze the usability of educational board game design developed based on effectiveness, efficiency, and satisfaction parameter. Usability test was conducted using performance measurement method and the system of usability scale questionnaire was distributed to more than 30 respondents of elementary education level at the fourth, fifth, and sixth grade. Experimental study was done in the elementary school to collect the required data. Statistical analysis was applied to test the hypothesis. Result of this study shows that the usability of developed educational board game design is valid for the learning process of elementary school students at 5% significance level with usability level of 85% for effectiveness, 83% for efficiency, and 71% for satisfaction.

1. Introduction

English is one of the most widely spoken languages in the world and is used as an international language for communication [1]. Every day, millions of people use English to ease communication for various people all over the world when they meet each other. Good English proficiency will enable all people to read and understand English literature such as science for a relatively shorter time. This fact encourages people to learn English since elementary level. However, the current teaching-learning process mostly still applied conventional method, which did not support swift and fun English mastery. Some researchers have proposed the use of game as a learning media such as [2-5]. [2] And [3] suggested the use of cross number puzzle game to increase Arithmetic skill and the use of game to increase the motivation in learning English grammar. Meanwhile, [4] developed the education doll to learn traditional folk song, and [5] modified the design of Kansei board game to motivate the elementary student studying English. The last research deals with a newly proposed design with unproven usability. Thus, it is significant to do the testing to prove the usability of the newly propose design.

Usability is defined as the level at which an object can be used by certain users to achieve specified goals effectively, efficiently for satisfying result such as board game [6]. Usability is also used to measure the level of user experience when interacting with some products. In general, usability refers to how users can learn and use products to achieve their goals, and how satisfied they are with their
usability [7]. One of the usability analyses is based on performance measurement and user satisfaction.

The objective of this study is to analyze the usability of educational board game developed based on effectiveness, efficiency, and satisfaction parameter.

2. Research Method

2.1 Performance Measurement Method

The performance measurement method is to measure how effective and efficient the use of the object developed [8]. Subsequently, [8] stated the formulation to determine level of effectiveness and efficiency in this method as follows:

\[
\text{Effectiveness} = \frac{n_{ij}}{N} \times 100\% \quad (1)
\]

Where \( n_{ij} \) is the number of task completed successfully which is the result of the task which is completed successfully by user and \( N \) is the total number of task which is the amount of task that should be carried out by the user.

\[
\text{Efficiency} = \frac{\sum_{i}^{R} \sum_{j}^{N} n_{ij} t_{ij}}{\sum_{i}^{R} \sum_{j}^{N} t_{ij}} \times 100\% \quad (2)
\]

Where \( N \) is the total number of tasks (goals), \( R \) is the number of users, \( n_{ij} \) is the result of task \( i \) by user \( j \) which is if the user successfully completed the task, then \( n_{ij} = 1 \), if not, then \( n_{ij} = 0 \) and \( t_{ij} \) is the time spent by user \( j \) to complete task \( i \). If the task is not successfully completed, then time is measured till the moment the user quits the task.

2.2 System Usability Scale (SUS) Method

System Usability Scale (SUS) method is a questionnaire used to measure the usability of computer systems according to the viewpoint of the user subjectively [9]. The questionnaire consists of ten statements about the level of satisfaction of the object developed according to the user. They are [9]:

- Frequency of use the board game,
- Complexity of the board game,
- Easy to use of the board game,
- Assistance need of a technical person to use the board game,
- The various functions of this board game is well integrated,
- Inconsistency problems in the board game,
- Easy to learn to use the board game,
- Cumbersome problem in use,
- Confidences in using the board game,
- and Difficulties to learn in starting this board game.

Each statement was rated based on a 5-point Likert scale that consisted of strongly agree (5) to strongly disagree (1). Then, SUS score was determined to refer to the classification of those statements, that the odd statements were reduced by 1 point (one) from a score provided. On the contrary, the score was reduced from the number of 5. Therefore, the result would be in the range of 0 to 4. Finally, the SUS score was the sum of all score of the 10 statements multiplied by 2.5 [10].

2.3 Empirical study

2.3.1 Apparatus. The technical equipment needed for this study are stopwatch was used to calculate the processing time of the performance measurement test, form of the task was used as a guideline for the respondent's to answering the question, the System Usability Scale (SUS) script questionnaire was used to assess respondents' satisfaction with the English game board educational game tool and IBM SPSS software version 22 was used to process statistical data.

2.3.2 Design of experiment. Experiment study was carried out at school by completing some assignments, which consist of 5 tasks and by filling the SUS questionnaire. 30 subjects participated in this experiment and they were divided into 3 group of grades namely grade 4, grade 5, and grade
6. Each grade consists of 10 subjects. The experiment was done by two methods namely the conventional method and the newly proposed board game. Layout design of the Performance Measurement test room is presented in Figure 1.

![Layout of the performance measurement test room](image)

**Figure 1.** Layout of the performance measurement test room

### 2.3.3 Task
The task of this study is to write 5 names of fruits, animals, objects in English and their meanings. Another task is to read and memorize some English words correctly about Apple, Lemonade, Grape, Engine, Table, and Chair and their meanings. All task was done after learning by using board game and conventional method.

### 2.3.4 Procedure of experiment
The experiment procedures consist of 5 steps as is in the followings:
1. Explaining the purpose of the test
2. Training the respondent to be familiar with the way to operate the board game.
3. Respondents are instructed to do the test using the board game.
4. The duration of the test is recorded with time measurement from the beginning.
5. The researcher will assess the completed task by the respondent to be proceeded to the next task
6. After task completion, the respondent will fill in the System Usability Scale (SUS) questionnaire

### 2.3 Statistical Analysis
Parametric statistical analysis was implemented in this study. One Way ANOVA correlation was employed to test the significant correlation among three groups [10] that is grade 4, grade 5, and grade 6. T-test correlation was used to test the significant difference between the two groups [10] consisting of the students using board game and the students using conventional method.

### 3 Result and Discussion

#### 3.1 Result of usability analysis
Figure 2 shows the developed virtual design of board game of the previous study. It contains button, which functions as an activation to listen to the pronunciation of English speaker. The Button consist of 42 buttons. The next part is a power button that functions to turn on the board game, while the small drawer is used to keep a dice for playing the board game and two speakers.
Figure 2. The Board Game

Table 1 presents the result of usability test, which contains effectiveness, efficiency, and satisfaction attribute of the proposed method using board game in learning English. It shows that the proposed method using board game results in 83% of effectiveness for grade 4, 86% for grade 5, and 86% for grade 6 with an average score of 85%. The next column is the result of efficiency test which results in 79% of efficiency for grade 4, 83% for grade 5, 86% for grade 6 with an average score of 83%. The last column is the result of satisfaction with 72.5% of satisfaction for grade 4, 72.5% of satisfaction for grade 5, and 68.25% of satisfaction for grade 6 with an average score of 71%.

Table 1. Result of Usability test of the proposed design

| Grade Level | Effectiveness | Efficiency | Satisfaction |
|-------------|---------------|------------|--------------|
| Grade 4     | 83%           | 79%        | 72.5%        |
| Grade 5     | 86%           | 83%        | 72.5%        |
| Grade 6     | 86%           | 86%        | 68.25%       |
| Mean        | 85%           | 83%        | 71%          |

3.2 Result of Parametric Statistical Analysis

Table 2 shows the result of the hypothesis test among the three grade groups that is grade 4, grade 5, and grade 6 on effectiveness and efficiency in using the proposed design of board game to learn English. The test generates no significant difference among the three grade groups at 5% of significant level. It is provided with the sig (2-tailed) value of .473 and .426, which sig > 0.05. The null hypothesis can be accepted. This means that there are no differences between the three groups. It means that the board game can be used by the three groups of students of grade 4, grade 5, and grade 6 as an educational tool for English learning-process.

Table 2. One Way ANOVA test result

| Aspect      | Sig.  |
|-------------|-------|
| Effectiveness| .473  |
| Efficiency  | .426  |
Meanwhile, the result of hypothesis test using t-test about the difference between the proposed method and conventional method can be seen in table 3. This test found that null hypothesis is not accepted with the sig (2-tailed) values of 0.00 for effectiveness, 0.00 for efficiency, and 0.10 for satisfaction of less than 0.05. It means that there is a significant difference between the proposed method and the conventional method.

**Table 3.** Result of the difference test between the conventional and the proposed method

| Parameter      | Sig (2-tailed) |
|----------------|----------------|
| Effectiveness  | 0.00           |
| Efficiency     | 0.00           |
| Satisfaction   | 0.01           |

**Figure 3.** The Result of The Performance Test Between Three Groups of Grades

**Figure 4.** The graphic of the usability test between the conventional method and the proposed method using board game
Figure 4 shows the different usability test result between the conventional method and the proposed method using board game. The effectiveness result of the proposed method using board game is 85% and the conventional method is 65%. It means that the average standard value of the task completion rate is 78% [11], while the conventional method is below the average standard and the proposed method is above the average standard. Meanwhile, the proposed method using board game is more effective than the conventional method. The next is the result of efficiency, which generates 63% of efficiency of the conventional method and 83% of efficiency of the proposed method using board game. The difference between the two methods is caused by the fact that the students are more motivated because of the proposed method using board game is more fun, so the students can memorize the vocabulary faster. Thus, the proposed method is more efficient than the conventional method. The last is the result of satisfaction, which produces 64% of satisfaction of the conventional method and 71% of satisfaction of the proposed method using the board game. This is so because using the board games makes the students more motivated to learn because their school lacks the facility to help the process of learning English. It is no wonder that they are satisfied with the presence of the board game. According to Figure 5, the score for the conventional method is in the low category, while the proposed method is in the high category, so that this means that the board game is more acceptable but still needs development.

4. Conclusion
Based on this study, the percentage of effectiveness and efficiency of the developed English board game is 85% for effectiveness and 83% of efficiency, the satisfaction level of the developed English board game is 71% (high level) which is acceptable and the English board game developed is valid and differs from the conventional method in learning English at 5% significant level and this means that the proposed design of board game is more effective (85% > 65%), more efficient (83% > 63%), and more satisfying (71 > 64). It means that the developed English board game has high usability.

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