# Analysis of Usability Game Educational Learning of Wayang Characters Using Usability Scale System

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*Abstract*— Indonesia is a country that has a lot of diversity in customs, arts, and culture in which each region has different characteristics. One of them is Puppet which is an entertainment that shows shadows, namely a jagged painting performed by a puppeteer on the surface of a screen made of white cloth. But lately, the art of puppet culture is less attractive to some people who think that this puppet culture is old and outdated. For this reason, this cultural art needs to be brought back as an effort to preserve local culture and can be used to introduce puppet figures from the Mahabharata epic such as the Five Pandavas. From these problems, an Educational Game of puppet Characters was created for the Android platform which was made using the Unity game engine and developed using the MDLC (Multimedia Development Life Cycle) method. From the application that has been made, usability testing is carried out using a System Usability Scale (SUS) questionnaire. Based on the test results, this application has a SUS score of 78.125. From this score, it can be interpreted that the application has an acceptance level of "Acceptable" on the acceptability ranges assessment, then has value of letter "C" on the grade scale assessment and has a "Good" rating on the adjective ratings assessment.

*Keywords— Puppet, Educational Game, Unity, Multimedia Development Life Cycle, System Usability Scale*

## I. INTRODUCTION

Indonesia is a country that has a lot of diversity in customs, arts, and culture, each region has different characteristics. One of them is "Wayang Kulit" which is a cultural art typical of Java, Bali, and Lombok. Puppet is an entertainment that shows shadows, namely a jagged painting displayed by a "dalang" on the surface of a screen or screen made of white cloth [1].

The purpose of this Puppet show is not only for entertainment, but also to teach the noble values of life contained in it. However, nowadays, the art of puppet culture is less attractive to some people who think that the shadow puppets are old and outdated. Moreover, with the rapid development of information technology, the existence of local culture seems to continue to fade and is no longer seen. For this reason, this cultural art needs to be re-appointed as an effort to preserve local culture and can introduce puppet figures from the Mahabharata epic such as the Five Pandavas. Mahabharata tells the story of the conflict between the Five Pandavas and their cousins, the

hundred Kauravas, regarding the dispute over the land rights of the State of Astina. It is called the Five Pandavas because it consists of five figures, namely Yudhisthira, Bima, Arjuna, Nakula, and his twin brother Sadewa[2].

From these problems, an educational game was developed for smartphones, especially on the Android platform as a medium for learning puppet characters. Educational games are digital games designed to use interactive multimedia technology for educational enrichment that supports teaching and learning [3]. The concept of educational games emerged along with the emergence of various types of games (games). Educational games specifically have learning content and are intended to improve the ability of players to learn a material. The material to be conveyed in educational games can be easily accepted by players because of the interactivity and immersion provided by the game itself so that players are relaxed and open to receive all material [4].

Selection of learning media through educational games on digital platforms, especially Android to attract people who do not like conventional puppet media such as puppet shows with puppeteers, besides that now almost all levels of society have at least a smartphone device so that this media is expected to be relevant to the current situation and can reach targets user.

By making this application, users are expected to be able to more easily digest information and knowledge about the Pandavas with the presence of game elements in educational games than with conventional learning methods.

This Puppet Character Learning Educational Game was created using the Unity game engine. Game engine itself refers to a collection of simulation code modules that indirectly determine game behaviour (game logic) or game environment (data level) [5]. Unity developed by Unity Technologies is one of many game engines that can be used as a two-dimensional or three-dimensional game development tool [6].

This study discusses the usability of applications that have been made by testing using the System Usability Scale. Usability is a qualitative analysis that assesses how easy the interface of an application is to use [7]. So the purpose of this test is to see whether the game that has been made can be easily

used by users or not. According to ISO (International Organization for Standardization) 9241-11, usability measurement consists of at least 3 separate components that must be determined relative to the context of use, namely Effectiveness, Efficiency, and Satisfaction. And System Usability Scale (SUS) is one method that can be used to measure the usability of a system or application according to the user's subjective point of view [8].

System Usability Scale (SUS) is often used as a usability measurement method because it is simple and relatively easy to implement. SUS focuses on administering a questionnaire with a Likert scale very quickly to the user right after interacting with the system, resulting in a score known as the SUS score [9]. The selection of the System Usability Scale as a method of measuring the usability of an educational game is also based on previous similar studies [10], [11], [12].

## II. RESEARCH METHOD

The system design method used in this study is the Multimedia Development Life Cycle which has six stages, namely concept, design, material collection, assembly, testing, and distribution as shown in Fig.1 [13].
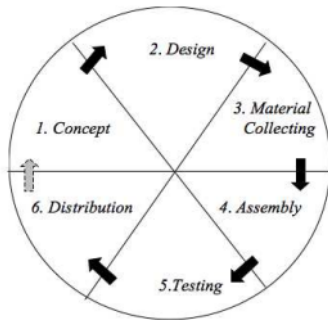


Fig. 1. Multimedia Development Life Cycle

The concept of the application that will be made is a 2D Educational Game which contains learning material for the Pandava characters and contains several games such as 'Guess Me' which contains multiple choice questions that must be answered and 'Find Words' which is a game to find words on a block of letters. -random letters.

At the design stage, the initial steps taken in the design of the application design are making the application navigation structure and flow chart as shown in Fig. 2 and Fig. 3. The navigation structure describes the sequence of information flows in educational game applications and flowcharts or flowcharts describe the flow or course of the application. in general.
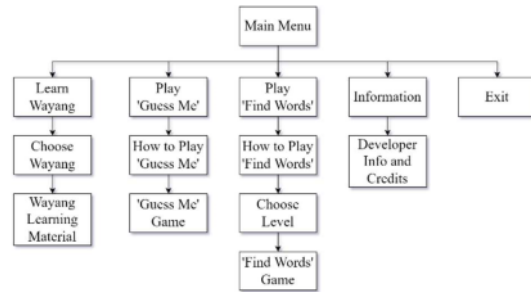


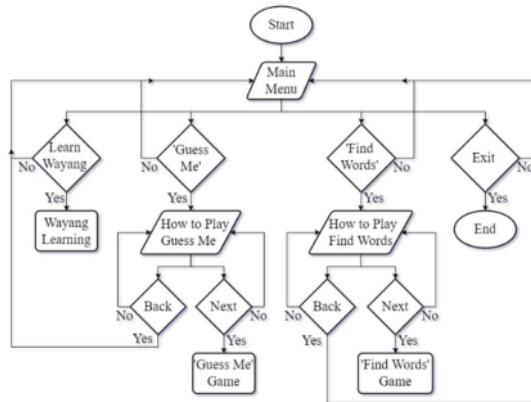Fig. 2. The navigation structure of the Pandava Puppet Educational Game



Fig. 3. Flowchart of the Pandavas Puppet Educational Game

At the material collection stage, materials are needed such as image assets, programming scripts, and sound assets are created and collected. Some of the image assets such as wayang characters were created using the Sketchbook application and some of the other image assets and sound assets were obtained from the Unity asset store and websites that provide free game assets. Then the script in this application is made with the Visual Studio Code text editor using the C # programming language before being compiled on the Unity engine.

The next stage is the assembly containing the assembly process of all materials or materials that have been made and collected into a single multimedia application as planned at the concept and design stages. All assets such as images, programming scripts, and sounds that have been collected and designed will be combined into several different scenes through the Editor in Unity.

At the testing stage, usability testing is carried on the application. Usability testing is carried out on this application using the system usability scale (SUS) method. The SUS questionnaire can be used to measure the level of user satisfaction for a product. Respondents were asked to rate the 10 SUS statement items according to their subjective assessment [14]. The System Usability Scale questionnaire consists of 10 statement items, these statements have been translated from English to Indonesian as shown in Table 1 [15].

| No | Statement Items |
|----|-----------------|
| 1 | I think I will use this system again |
| 2 | I find this system complicated to use |
| 3 | I find this system easy to use |
| 4 | I need help from someone else or a technician in using this system |
| 5 | I feel the features of this system are working properly |
| 6 | I feel there are a lot of inconsistent (incompatible) things in this system |
| 7 | I feel others will understand how to use this system quickly |
| 8 | I find this system confusing |
| 9 | I feel there are no obstacles in using this system |
| 10 | I need to get used to it first before using this system |

At the distribution stage, games that have been made on Unity are exported into files or files with the .APK extension and then saved into smartphone storage so that they can be shared with users who need them and so that installation can be carried out on each user's smartphone.

## III. RESULT AND DISCUSS

Usability testing was carried out using the SUS (system usability scale) questionnaire. Testing is carried out online or online through a google form given to 20 respondents with an age limit of 18 to 40 years. First, the respondent will download the application via the link provided, then install and use the application first on each respondent's Android device. The following are examples of some of the views of the applications that have been made shown in Fig. 4 to 7.

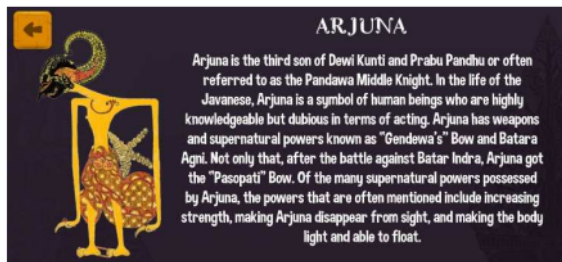Fig. 4.   Display of the Application Main Menu

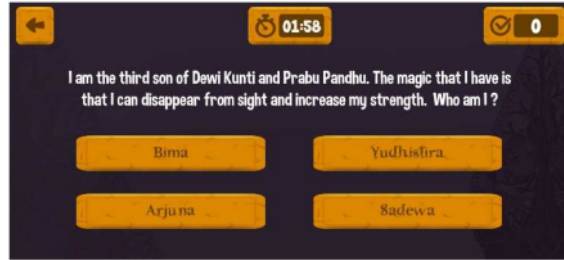Fig. 5.   Display of Puppet Learning Materials

Fig. 6.   Display of the Guess Me Game

Fig. 7.   Display of the Word Search Game

After the respondent has tried all the features and games in the application, the user can then rate the application using the SUS questionnaire given. Table 2 shows the results of the SUS questionnaire from 20 respondents using a 5-point Likert scale with a value of 1 being Strongly Disagree and 5 being Strongly Agree.

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| No | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
|----|----|----|----|----|----|----|----|----|----|-----|
| 1 | 4 | 1 | 5 | 1 | 5 | 2 | 5 | 1 | 5 | 1 |
| 2 | 5 | 1 | 5 | 1 | 4 | 2 | 4 | 1 | 4 | 2 |
| 3 | 3 | 2 | 4 | 2 | 4 | 2 | 4 | 1 | 4 | 2 |
| 4 | 4 | 3 | 3 | 1 | 4 | 3 | 4 | 2 | 5 | 5 |
| 5 | 4 | 2 | 4 | 2 | 4 | 2 | 5 | 2 | 4 | 3 |
| 6 | 4 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 |
| 7 | 4 | 2 | 5 | 2 | 5 | 1 | 5 | 1 | 5 | 1 |
| 8 | 2 | 2 | 4 | 2 | 2 | 2 | 3 | 2 | 4 | 2 |
| 9 | 3 | 2 | 4 | 1 | 5 | 2 | 4 | 2 | 4 | 4 |
| 10 | 4 | 3 | 3 | 4 | 3 | 3 | 4 | 2 | 4 | 2 |
| 11 | 4 | 2 | 5 | 1 | 4 | 2 | 5 | 2 | 5 | 1 |
| 12 | 5 | 2 | 5 | 1 | 5 | 2 | 4 | 2 | 2 | 3 |
| 13 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 3 |
| 14 | 4 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 |
| 15 | 4 | 1 | 5 | 1 | 4 | 2 | 4 | 2 | 5 | 1 |

| No | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
|----|----|----|----|----|----|----|----|----|----|-----|
| 16 | 4 | 1 | 5 | 1 | 4 | 1 | 4 | 2 | 4 | 4 |
| 17 | 4 | 2 | 4 | 5 | 4 | 2 | 5 | 1 | 5 | 1 |
| 18 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 |
| 19 | 3 | 2 | 5 | 1 | 5 | 3 | 5 | 2 | 5 | 2 |
| 20 | 3 | 4 | 3 | 3 | 2 | 3 | 3 | 4 | 4 | 4 |

Then calculated the value of the questionnaire data system usability scale (SUS). To calculate the score on the SUS has its own rules, namely [14]:

    a.  The value of the odd number statement item is the answer scale minus 1.

    b.  The value of the even number statement item is 5 minus the answer scale.

    c.  The results of the rating scale are 0 - 4 (4 is the best answer).

    d.  The value of the SUS score is by adding up all the results of the scale assessment then multiplying by 2.5.

    e.  The range of scores ranges from 0-100.

Based on these rules, the following is the formula for calculating the SUS score shown in equation 1 [16]:

$$x = \begin{pmatrix} (Q1\text{-}1) + (5\text{-}Q2) + (Q3\text{-}1) + (5\text{-}Q4) \\ + (Q5\text{-}1) + (5\text{-}Q6) + (Q7\text{-}1) \\ + (5\text{-}Q8) + (Q9\text{-}1) + (5\text{-}Q10) \end{pmatrix} \times 2.5 \qquad (1)$$

Description:

x    : SUS scores.

$Q1\text{-}10$ : The value of the answer scale for question item number 1-10.

Using this equation, it can be calculated the SUS scores of each respondent which is shown in Table 3.

TABLE III.    The results of each respondent's SUS score calculation

| No | Respondent | Score |
|----|-----------|-------|
| 1 | Respondent 1 | 95 |
| 2 | Respondent 2 | 87.5 |
| 3 | Respondent 3 | 75 |
| 4 | Respondent 4 | 65 |
| 5 | Respondent 5 | 75 |
| 6 | Respondent 6 | 97.5 |
| 7 | Respondent 7 | 92.5 |
| 8 | Respondent 8 | 62.5 |
| 9 | Respondent 9 | 72.5 |
| 10 | Respondent 10 | 60 |
| 11 | Respondent 11 | 87.5 |
| 12 | Respondent 12 | 77.5 |
| 13 | Respondent 13 | 95 |
| 14 | Respondent 14 | 50 |
| 15 | Respondent 15 | 87.5 |
| 16 | Respondent 16 | 80 |
| 17 | Respondent 17 | 77.5 |
| 18 | Respondent 18 | 100 |
| 19 | Respondent 19 | 82.5 |
| 20 | Respondent 20 | 42.5 |
| | Total | 1562.5 |

Then from the SUS score of each respondent the average score is sought by adding up all scores and dividing by the number of respondents. The following formula for calculating the average SUS score is shown in equation 2 [17]:

$$\bar{x} = \frac{\sum x}{n} \qquad (2)$$

Description:

$\bar{x}$    : Average SUS score

$\sum x$  : Total SUS score of all respondents

n    : Number of respondents

Using this equation, the following details the calculation of the average SUS score

$$\bar{x} = \frac{1562.5}{20} = 78{,}125$$

In interpreting the calculation result in the System Usability Scale (SUS) assessment there are three points of view used, namely acceptability, grade scale, and adjective rating. In the interpretation using Acceptability, there are three levels consisting of not acceptable, marginal (low and high), and acceptable. Then the interpretation uses a grade scale consisting of A, B, C, D and F. And in the interpretation using an adjective rating there are six levels, namely worst imaginable, poor, ok, good, excellent, and best imaginable [14].

Based on the calculation results, the average SUS score of 20 respondents was 78.125. The result of the average score of 78.125 can be interpreted using the point of view of acceptability ranges, grade scale, and adjective ratings as shown in Fig.8.
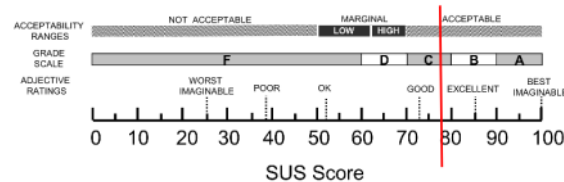


Fig. 8.  Usability assessment of Pandavas Puppet Educational Game [18]

It can be seen in Figure 8 that the average score of SUS 78.125 has an Acceptable level of acceptance from the point of view of acceptability ranges. From the point of view of the grade scale, the SUS score obtained has a grade value on the letter "C". Then in terms of adjective ratings, the SUS score obtained has a "Good" rating.

## IV. Conclusion

From the results of usability testing conducted on 20 respondents using the System Usability Scale questionnaire, the Puppet Character Learning Educational Game had an average SUS score of 78.125.

From this score, it can be interpreted that the application has an "Acceptable" acceptance rate on the acceptability ranges assessment, then has a "C" value on the grade scale assessment and has a "Good" rating on the adjective ratings assessment.

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