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UI/UX Implementation for Junior High Adventure Game using UCD Method in P5 Project

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ABSTRACT

One of the activities in the independent learning curriculum is the Pancasila Student Profile Strengthening Project (P5), a project-based co-curricular activity aimed at enhancing competence and character according to the Pancasila learner profile, based on Graduation Competency Standards. One theme of the P5 project is engineering and technology, where students create innovative works using technology to solve problems in their educational environment, such as environmental pollution and limited educational resources. An example outcome is the adventure game "The Ghost," designed to foster students' creativity in digital production, not just as users. Given the high rate of game addiction among students, this project is particularly relevant.

The study utilized the User Centered Design (UCD) methodology to develop and assess the usability of the "The Ghost" user interface, created with Construct 2. The UCD process comprised user research, design, prototyping, and testing stages. Initial user research involved surveys and interviews to gather user needs and preferences. These insights informed the design stage, where user interface prototypes were created and refined iteratively based on feedback. In the testing stage, usability was evaluated with real users who performed tasks and completed the System Usability Scale (SUS) questionnaire. The game was tested on Android devices, and the results showed that it is highly usable, with 85% of respondents rating it positively, and an interval scale score of 77.68 classifying the application as good and entertaining. Additionally, the game ran smoothly on Android, further validating its usability and performance.

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1. INTRODUCTION

Merdeka Belajar is the latest curriculum applied to education in Indonesia which carries the concept of happiness in creating a learning atmosphere for each learner (Saleh, 2020). Where students have more time to explore concepts and strengthen competencies in diverse and more optimal intracurricular learning.

One of the activities carried out in the independent learning curriculum is the Pancasila Student Profile Strengthening Project or abbreviated as Pancasila Student Profile Strengthening Project. Where this activity is a project-based co-curricular activity designed to strengthen efforts to achieve competence and character in accordance with the Pancasila learner profile which is compiled based on the Graduation Competency Standards (Irawati, 2022). P5 activities are carried out flexibly both in terms of content, activities, and implementation time. This P5 activity is also held separately from intracurricular activities by taking a certain theme that has been provided by the Ministry of Education and Culture. This is because the objectives, content, and activities of project learning are not related to the objectives and materials of intracurricular lessons.

One of the themes of the P5 project is engineering and technology. The utilization of technological equipment in everyday life makes work easier and more integrated with each other (Kaligis, 2020). In this theme, students are freed to create innovative works by utilizing technology to solve problems in the environment around the education unit. One of the works is to create an adventure game "The Ghost". The game was created with the aim of making students more creative in creating digital works not only as users or users. Given that nowadays there are many students who are addicted to playing games. They tend to spend time playing online games that bring bad influence to their lives. Such as being lazy, forgetting time, not doing assignments or homework, and even causing criminal acts such as extortion just to get money to play online games. For this reason, instead of being a user, it would be more beneficial if students can create their own games.

In designing a good game, you must pay attention to the user interface and user experience so that the game created can make it easier for users to play it and get a good response from users (acceptable) (Setiawansyah, 2021). The adventure game "The Gosh" made must really pay attention to these elements so that it can be accepted and not inferior to other games that have been marketed. The purpose of making this adventure game "The Ghost" is to increase student creativity in creating digital works.

Requirements modeling design is an important aspect if it is related to the *end* user experience approach (Subhiyakto, 2021). In this study using the UCD (*User Centered Design*) model as the approach model. The model was chosen because it is a design concept with an application user approach. Where the purpose of this model is to help determine the appropriate interface based on user attractiveness. The results of this research are in the form of recommendations for user interface and user experience of adventure prototype games.

1. User interface (UI)

User interface (UI) is a term used to describe the appearance of a machine or computer that interacts directly with users. The design and arrangement of the interface display needs to be considered to produce a good display (Muhammad, 2018). User Interface is a science that studies the layout of graphic design on the appearance of a website or application (Muhyidin, Muhyidin, Muhammad Agus, 2020). UI focuses more on the beauty of the appearance of a website or application. A UI designer is responsible for arranging text elements, colors, lines, buttons, images, and all elements in the appearance of a website or application. (Jamilah, 2022) states that User Interface is a way used to interact between humans and systems. Sometimes, UI is referred to as a substitute for Human Computer Interaction (HCI) which includes all interactions made by humans to computers. Things that need to be considered to create a user interface design are a good user interface that does not require many design elements, a consistent design that makes users feel comfortable, considering the layout between items and others so that the placement of items can attract attention and help readability, colors that are not too contrasting to give more attention, the importance of typography to create hierarchy and clarity, considering the typeface, size, font and arrangement of text to help improve readability, make sure the system can communicate what is happening, give information to users in case of errors, status changes and actions (Arfianto, 2022).

2. User experience

User experience is a person's perception and response from that person in using a product, system, or service user experience (UX) to assess how much satisfaction and comfort a person has in using products, systems and

services (Rahman, 2020). In UX has a principle that users have the power to determine the level of self-satisfaction *(customer rule)*. No matter how good the features of a product, system and service without user satisfaction, it will be considered to have low UX. Good User Experience meets the needs of users with simplicity and elegance of products that are fun to own and fun to use (Purnomo, 2018). The application must be easy to use to complete or do the things the user wants (Sianturi, 2021). The development of the digital and mobile world has made UX more consistent (Fernando, 2020). Now a person can access a website from various devices.

2. Game

Games are a form of participatory, interactive and entertainment for a person. When someone plays a game, they are entertained by actively participating in the gameplay presented. Games are applied to an artificial or imaginary world that is organized through rules. These rules determine the actions or steps that players can and cannot take in a game (Tanjung, 2021). Games are actually important for brain development, to improve concentration and train to solve problems precisely and quickly because in games there are various conflicts or problems that require us to solve them quickly and precisely (Ramsari, 2018). A game usually has its own point of view of the game adjusted based on the game genre taken (Hoesen, 2022). Generally, in games, there are targets that players want to achieve. Games are complex activities in which there are rules. Rules aim to limit player behavior and define the game. Games aim to entertain and improve concentration (Ardyanto, 2018).

Based on the dimensions of its objects, games can be divided into several types, including:

a. 2D Games

Two-dimensional or 2D games are a concept where all objects are on one flat plane (Khairani, 2021). 2D games also don't need so many control buttons to play them. In addition, the simple graphics contained in 2D games will be very easily accepted by users, especially users who are still children.

b. 3D Games

Three-dimensional or 3D games are a concept that has shape, volume, and space. So that this object has X, Y, and Z coordinates. In general, 3D objects have sub-objects in the form of elements that form the object, which are Vertex, Edge, and Face (Fadya, 2018).

User Centered Design (UCD) is a design philosophy where the needs, desires and limitations of users of an interface are given extensive attention for each stage of the design process (Rianto, 2022). The stages in the *User Centered Design* (UCD) method can be seen in Figure. 1, below.

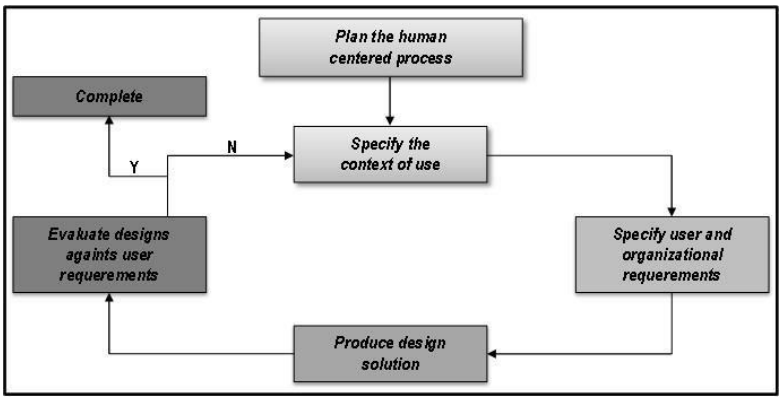

Figure. 1. *User Centered Design* (UCD) Method

User centered design is the stages of interface design that focuses on usability, user needs, environment, tasks, and workflows in the design (Supardianto, 2020). Things that need to be considered in UCD:

a. The target of application development is the user
b. Structured or integrated design
c. The testing process from start to finish involves
d. Users
e. Interactive design

The UCD method is a system development method that focuses on the user as the center of system development, the objectives or properties, context and system environment are all based on user experience (Wijaya, 2021).

3. Usability

Usability can be defined as effectiveness, efficiency, and satisfaction in meeting the goals set by the user directly. An application has a different level of *usability* depending on how the user can complete a series of scenarios or tasks (Yudhakesuma, 2022). Usability is part of the science of Human Computer Interaction which focuses on studying interface design and interaction between humans and computers (Sukmasetya, 2020). Measuring system usability is very important to determine the high or low level of usability of a system. Systems that have high usability will be used for a long time because many people feel the benefits of the system. Meanwhile, systems that have low usability will eventually be ignored by users (Supriyatna, 2018)

2. METHOD

Explaining research chronological, including research design, research procedure (in the research methodology here is to collect the data needed for the smooth development of adventure game applications. There are several stages that will be carried out to get maximum results which can be seen in Figure 2. the following application development scheme:

1. Literature study

Search for information and understanding through scientific journal articles and forums related to each word in the title of this research, namely adventure game user interface recommendations with the *user-centered design* method.

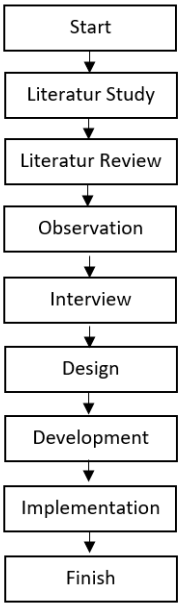

Figure. 2. Application Development Scheme

2. Literature Review

Data collection obtained from relevant journals, so that the data collected can be used in helping to solve problems in the research and be able to provide strong evidence of the need for this research.

3. Observation

Direct observation of game usage patterns, namely for junior high school children. Then analyze the pattern so that it can be used as a reference.

4. Interview

Interviews with 25 respondents consisting of 5 junior high school teachers, 5 parents, and 20 junior high school children to get information on whether they have used android applications to play games, how useful it is to make their own games, to get information about how useful this technology is, what obstacles are encountered when using / utilizing games with android applications.

5. Design

Making application design using architectural design and user interface design applications. In designing the application system, namely planning the activity system in the application and will be made using the User-centered Design method.

The form of application designed and developed is an adventure game application, which has an element of entertainment.

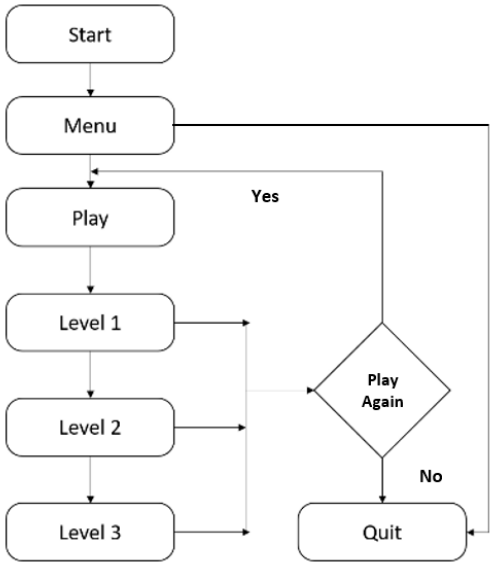

Figure. 3. "The Ghost" adventure game design flowchart

Figure. 3. shows the flowchart of the design of the adventure game application "The Ghost", which starts from the main page, the main menu page which has 2 choices, namely start and quit. Then there are levels of play in the game, namely Level 1, Level 2, and Level 3 and there are settings and instructions for continuing the game or completing the game.

6. Programming

Programming in this study uses Construct 2 software developed by Scirra Ltd, where Construct 2 is an integrated software for making 2-Dimensional games based on HTML 5, and Construct 2 supports various platforms such as PC, iPhone, Mac, Android, IOS and browsers. This application does not use a special programming language, because all commands used in the game are arranged in an EvenSheet consisting of Events and Actions.The appearance of the application will be made attractive, easy to understand and operate by users.

7. Implementation

The implementation of the results of designing this adventure game application is how this adventure game can be a means of entertainment. Implementation here starts from downloading projects and applications, installing applications to Android, and testing application programs on users and testing to show the level of *usability* according to users using the *System Usability Scale* (SUS), which will be assessed on a Likert scale, through questions given in the questionnaire.

3. RESULTS AND DISCUSSION

The results of the research and design of the "The Ghost" adventure game application that has been carried out which aims to develop students' skills in working on the Pancasila student project are made using Construct 2 software. The following is the implementation of the appearance of each page in the adventure game application that has been designed.

Display of loading page

Figure. 4. Display of loading page

Main page view
The main page consists of a play button to start the game and a quit button to exit the game

Figure. 5. Main page view

Level 1 page view
On the level 1 page, the user can start the adventure game by collecting coins and avoiding attacking enemies. In the game, the user is only given six chances to lose to the enemy.

Figure. 6. Level page 1

Button description :
Spaces : for jump
Left arrow : to go backwards
Right arrow : to go forward

Level 2 page view
At level 2, the challenges are more difficult than level 1

Figure. 7. Level 2 page view

Level 3 page view
At level 3, the challenges are more difficuts thatn level 2.

Figure. 8. Level 3 page view

After the user has tried the petuaangan game that has been designed, the next step is to conduct testing using the *System Usability Scale* from 40 respondents. To calculate the SUS score, first the contribution score of each item is summed up the contribution score of each item will range from 0 to 4. For items Q1, Q3, Q5, Q7, and Q9 the score contribution is the scale position minus 1. For items Q2, Q4, Q6, Q8 and Q10 the score contribution is 5 minus the scale position. Then multiplied by a value of 2.5 to obtain the overall SUS score. (SUS score has a value between 0 and 100). The scoring system used is a questionnaire.

Table 1. Calculation using the SUS formula

Respondent	Calculated Score										Amount	Score (Amount x 2,5)
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10		
1	4	2	4	2	4	3	4	3	4	2	31	78
2	4	2	4	2	4	3	3	3	4	2	31	78
3	4	1	4	2	4	2	4	2	4	3	31	78
4	4	2	4	2	4	2	4	2	4	2	30	75
5	4	2	4	3	4	3	4	3	4	2	33	83
6	4	2	3	2	3	2	4	3	4	3	29	73
7	4	2	4	2	4	3	4	2	4	2	31	78
8	4	3	4	2	4	3	4	2	4	2	32	80
9	4	2	4	2	4	2	4	2	4	2	32	80
10	4	2	4	2	4	2	4	2	4	2	30	75
11	4	2	4	2	4	3	4	3	4	2	32	80
12	4	2	4	2	4	2	4	2	4	3	31	78
13	4	3	4	2	4	2	4	3	4	3	32	80
14	4	3	3	2	4	2	4	2	4	3	30	75

15	4	2	4	2	4	2	4	3	4	2	30	75
16	4	2	4	2	4	3	4	2	4	3	31	78
17	4	2	4	2	4	3	4	3	4	3	30	78
18	4	2	4	2	4	3	3	3	4	2	30	75
19	4	2	4	2	4	2	4	2	4	2	33	83
20	4	3	4	2	4	2	4	2	4	2	31	78
21	4	2	4	2	3	2	4	2	4	2	29	73
22	4	2	4	2	4	2	4	2	4	2	33	83
23	4	2	4	3	4	2	4	2	4	2	31	78
24	4	2	4	2	4	3	3	3	4	3	32	80
25	4	2	4	2	4	2	3	2	4	3	30	85
26	4	3	4	2	4	3	4	2	4	2	33	83
27	4	3	3	2	4	3	4	3	4	3	28	70
28	4	2	4	2	4	3	4	3	4	2	30	75
29	4	2	4	2	4	3	4	2	4	2	32	80
30	4	2	4	2	4	2	3	3	4	3	30	75
31	4	2	4	2	4	2	4	2	4	2	35	88
32	4	2	4	2	4	2	4	3	4	3	31	78
33	4	3	4	2	4	2	3	2	4	2	30	75
34	4	2	3	2	4	3	3	3	3	2	29	73
35	4	2	4	2	4	2	4	2	4	2	32	80
36	4	3	4	3	4	2	3	2	4	2	30	75
37	4	2	4	3	4	2	4	2	4	3	35	88
38	4	2	4	2	4	3	4	3	4	2	32	80
39	4	2	4	2	4	3	4	2	3	2	30	75
40	4	2	4	2	4	2	4	2	4	2	31	78
Total Score												3110

By calculating using the SUS formula, the total result is 3110.
Code Description:
Q1 Liked the app a lot and will play it many times
Q2 App is too complicated to play
Q3 The app is easy to use
Q4 Need help from others in playing the app
Q5 Parts of the app can be played well
Q6 How to play the app is confusing

Q7 Others will learn and play the app quickly
Q8 The app is cumbersome
Q9 Can play this app
Q10 Need to learn a lot to be able to play the app
Score description:
1 : Strongly Disagree
2 : Disagree
3 : Doubt
4 : Agree
5 : Strongly Agree

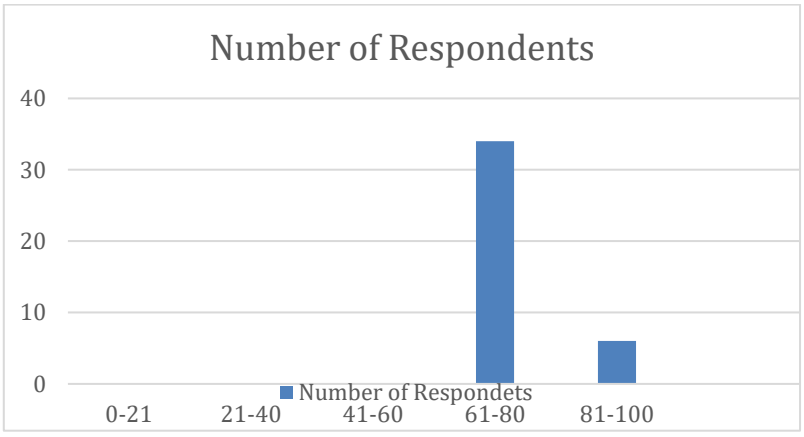

Figure. 9. Calculation graph with SUS formula

The percentage of respondents who said this educational game application was good was 85% , and followed by the number of respondents who said it was very good at 15%. The formula for calculating the average value uses the equation:

$$\bar{X} = \frac{\sum X}{n}$$

$\bar{x}$ = Averagae score
Σx = sum of SUS scores
n = Number of respondents
Then the average value of the results of the above calculations is 77.68. Furthermore, measuring the average results using an interval scale as follows:
Numbers 0 - 20: Very poor
Numbers 21 – 40: Bad
Numbers 41 – 60 : Enough
Numbers 61 – 80 : Good
Numbers 81 – 100 : Very Good

From these results, it can be determined that the value of 77.68 is between the 61-80 value criteria, so it is declared good to run without any errors. In addition, researchers also tested this educational game application on several android versions, including Samsung Galaxy note 8 Android Oreo 8.0 version, 6 GB Ram, 1440 x 2960 pixels, Samsung Galaxy note 9 Android Oreo 8.1 version, 8 GB Ram, 1440 x 960 pixels, and Xiaomi Redmi note 8 pro version 11.0.1, 6 GB Ram, 1080 x 2340 Pixels. "The Ghost" adventure game can run smoothly on all three android versions.

4. CONCLUSION

The conclusion of this research is that the user interface design of the adventure game "The Ghost," developed as part of the Pancasila Student Profile Strengthening Project using Construct 2, can be played easily by users. This is evidenced by 85% of respondents rating the application positively, with an interval scale score of 77.68 indicating the application is good and entertaining. The game is Android-based, enhancing its accessibility and playability. Based on usability testing using the System Usability Scale (SUS), the game demonstrates high usability.

Suggestions for future research include maximizing performance to fully leverage the SUS score of 77.68 and exploring additional factors that support users in recommending adventure games that match their interests and talents. It is also recommended to increase the data used in the testing process to obtain more comprehensive results.

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