VIRTUAL REALITY BASED ON NATIONAL HEROES INTRODUCTION (CASE STUDY: SDN SRENGSENG 04 PAGI)

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ABSTRACT

National Hero is a title given to Indonesian citizens who fought against the fallen colonialism in defense of the Indonesian nation and state. Basically elementary school children only know the heroes from textbooks on social science subjects. The problem faced by the teacher when explaining the material is that students are easily bored following the subject because the teacher only tells the history of the hero without anything interesting. One solution to create a learning process that is fun and not bored by making the delivery of information can be delivered more interactively and feels more real because it can reach the human senses, for example is VR (Virtual Reality) technology. The goal is to achieve a strong sense of presence in the virtual environment. Especially in the classroom, with that technology can be utilized in the classroom that is Virtual Reality Recognition of national heroes. By using the Prototype method, users can play an active role in the development of the system to be created. From the description of the problem above the appropriate method is to use the PIECES method. Where the results of the PIECES method can save time, get information that is more quickly absorbed when students use this application, students do not need to go to the location.

Keywords*: Virtual Reality, National Heroes, Elementary School*

Introduction

National Hero is a title given to Indonesian citizens who fought against fallen colonialism in defense of the nation and state of Indonesia, or produced outstanding achievements and works for the development and progress of the nation and state of the Republic of Indonesia thanks to a very heroic struggle[1].

The learning process that takes place between teacher and student media is needed as a tool that can stimulate the mind. Information technology that is currently growing is one of the technologies that are widely used in various fields including education. The conventional teaching and learning process is very boring for most students because only listening to the explanation from the teacher and using the textbook media makes students pay less attention to the material delivered by the teacher, for that the use of information technology can help the process of delivering the material to make it more enjoyable[2].

The problem is that education in Indonesia still uses many conventional methods, namely by listening to the teacher's explanation and using books, these methods make students easily bored [2]. IPS as an educational program and field of knowledge, not only presents social knowledge solely, but must also foster students to become citizens and

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citizens who have responsibilities towards society, nation and state. From the data obtained from State Elementary Schools 04 grades 3, 4 and 5, especially in the Social Sciences (IPS) subject, students who understand the lessons of each class are no more than 50%. This data is taken from midterm test scores. Therefore for students to be more active in learning there needs to be innovation in the method of learning[3],[9].

Virtual Reality (VR) is a computer simulated environment. Simulates a person's physical presence in the real and imaginary world. Many benefits can be taken from virtual reality technology, one of which is in the field of history. To be able to get to know the hero figure required an android-based application that can display information about the hero figure by utilizing virtual reality. This application can be used as one

of the new learning media solutions to recognize images of hero figures[4].

From the description of the problem above the appropriate method is to use the PIECES method. Where the results of the PIECES method can save time, get more interesting information when students use this application, save costs no need to buy modules and also be more efficient[5].

So based on the description above, the purpose of implementing the system is to create a learning method using Virtual Reality technology to introduce national heroes as a solution for new, interesting and interactive learning methods. And the results and benefits obtained are Increasing the interest of students to learn history and add knowledge and insight.

Method

Data collection

The method of data collection is Field Research (Field Research), carried out by carrying out direct observations on agencies that are the object to get primary and secondary data.

Data collection is carried out in research using observation and questionnaire techniques:

Observation

Make direct observations to SDN SRENGSENG 04 MORNING. Which is located at Jl. Srengseng Raya No.4, RT.4 / RW.3, Srengseng, Kec. Kembangan, Kota Jakarta Barat, Special Capital Region of Jakarta 12270. The savings made were observing the learning process that was taking place at the school.

Interview

In this process interviews were conducted directly with teachers from SDN Srengseng 04 Pagi. The questions asked are:

1. What lessons are taught at Srengseng 04 Morning Elementary School?

2. Full address of SDN Srengseng 04 Pagi?

3. What learning media are used at Srengseng 04 Morning Elementary School?

a. In the classroom:

b. Outside the classroom:

4. What problems are often faced during the learning process?

5. Have you ever provided material or explained about national heroes?

6. What is the reaction of the students when being explained?

7. Are there any difficulties in delivering the material?

8. Did you ever use technology?

9. How many employees are there at SDN Srengseng 04 Pagi?

Questionnaire

Questionnaires were administered to students at Srengseng 04 Pagi Elementary School on Jl. Srengseng Raya No.4, RT.4 / RW.3, Srengseng, Kec. Kembangan, West Jakarta City, Special Capital Region of Jakarta 12270. Questionnaires were distributed to 31 students who were in the school. From distributing questionnaires, calculations using the Linkert Scale are presented in **Table (3)** questionnaire data processing in the results and discussion chapter.

PIECES method

The PIECES method is used to identify system weaknesses that are recommendations for improvements that must be made on the system to be developed [6]. In analyzing a system, it will usually be carried out on several aspects including performance, information, economy, application security, efficiency and customer service. This analysis is called PIECES Analysis (Performance, Information, Economy, Control, Efficiency and Service).

Table 1. Analysis of PIECES

	does not achieve satisfactory results.
2. Information	For information from the learning process of introducing national heroes that have been applied so far do not meet the information needs needed in teaching and learning activities. Teachers still have difficulty delivering the material to be conveyed, because the characteristics of children such as lazy attitudes, children who are less responsive, students' passive absorption inhibits the learning process.
3. Economics	For this economy where storage of modules / learning books that are less secure often results in damage and loss, so from the case above modules / books that are lost and torn need to be replaced for that requires the cost of purchasing modules / books instead of missing modules / books and torn.
4. Control	For this processing the learning process that children receive from the material delivered by the teacher using modules / books that are used the same. This is because the learning received by children is very dependent on the ways and methods of delivering the material by the delivering teacher. If the teacher conveys material with reference to just one book, the material that children receive is also limited to the content of the material contained in the book.
5. Eficiency	For the efficiency of the learning process the introduction of a profession that has been applied inefficiently. To convey one and the same material needs to be done repeatedly but the material received and understood by children is very little and limited. This is because the learning process is very dependent on books and the way the teacher conveys the material, for children who are less active and do not like to read will have difficulty in understanding the material presented, causing a waste oftime

1. Performance	At present the process of learning the introduction of a hero requires quite a long time. Submission of learning materials that have been used so far, such as using textbooks, pictures and teaching aids, it turns out in addition to requiring a long delivery time also

6. Service	In this process the learning that has been applied has not been able to meet the information needs needed in teaching and learning activities. The teacher still has difficulty in delivering the material to be conveyed, the children also find it difficult to capture the material presented because of the limitations of teaching aids and supporting books.

Prototype System Development Method

In designing the concept of this Final Project proposal designed with the prototype method because by using this method in the process of making an application that is flexible to changes. Changes to the application can be made many times until an agreement is reached on the form and function of the developed application.

The key for this prototype model to work well is to define the rules of the game at the beginning, ie customers and developers must agree that the prototype was built to define needs. The prototype will be removed in part or in full and the actual software is engineered with the specified quality and implementation.

The process of prototyping can be explained as follows:

1. Needs Collection: the client and developer together define general objectives, identify needs and an overview of the system created.

4. Coding: In this stage prototyping that has been agreed is translated into the appropriate programming language.

5. Testing the System: After the system has become a ready-made software, it must be tested before being used. This test is done by Black Box.

6. System Evaluation: Customers evaluate whether the finished system is as expected. If yes, step 7 is carried out; if not, repeat steps 4 and 5.

7. Using the System: Software that has been tested and accepted by customers is ready for use.

Results and Discussion

The results and discussion in this study contain an explanation of the results of the research in detail about the research at SDN Srengseng 04 Pagi.

System Requirements Analysis (Requirement)

argues that the Analysis Phase is the stage in finding as much information about the system under study by conducting data collection methods so that the strengths and weaknesses of the system and user requirements are found. In addition, this stage is also carried out to look for problem solvers and analyze how the system will be built to solve problems in the previous system [7]. By analyzing the needs, it can explore the results of the right needs to build a Virtual Reality National Hero Recognition system. In building this system, several needs must be prepared, including:

2. Design: Design is carried out quickly and the design represents known aspects of the application and this design forms the basis of making a prototype.

3. Prototyping Evaluation: This stage is carried out by the client, whether the prototyping that was built was in accordance with the wishes and needs of the client or not. If it is not appropriate, prototyping will be revised by repeating the previous steps. But if it is suitable, then the next step will be implemented.

Software   requirements   analysis (Software)

The software required at the time of making the application are:

1. Windows 7 Operating System

2. Enterprise Architect

3. Unity 3D

4. Blender

5. Microsoft Office 2016

6. Adobe Photoshop

Hardware Requirements Analysis

Hardware (Hardware) has an important role in making programs and data processing because to be able to implement a system that has been designed, the hardware required in accordance with the proposed system. The hardware required at the time of making the application are:
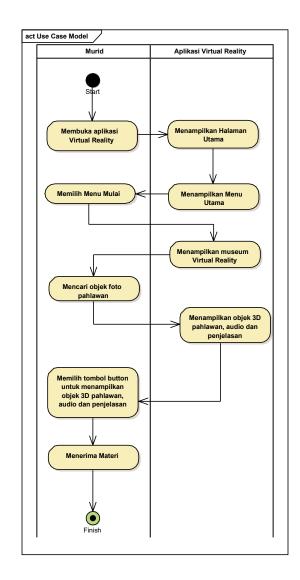
1. Laptop core I 3 6-8GB RAM

2. Android Smartphone

Proposed System Diagram

Diagram of the proposed system has a process, then the process can be illustrated in the following diagrams.
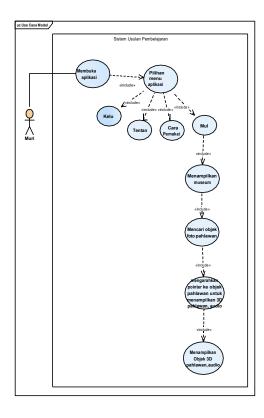
Activity Diagram

Activity diagram is a picture of each user's activity with the system. The following are some activity diagrams from the National Hero Introducing Virtual Reality system:
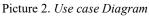

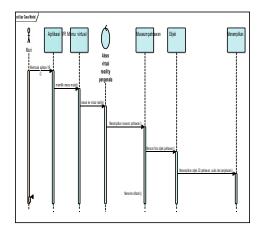Picture 1. *Activity Diagram*

Use Case Diagrams

Use case is a modeling for the behavior (behavior) of the information system that will be created. Use case diagrams illustrate the relationship of actors with the system. The following is a use case diagram of the National Hero Introducing Virtual Reality system:

Picture 2. *Use case Diagram*

Picture 4. Encoding Script Menu

The Design Results of Display Design of Virtual Reality Application Introduction of National Heroes

Menu Display

The following is the main menu display, there is a start button, about, how to use and exit. At this stage the user must select a button before entering the next page.

Sequence Diagram

Sequence diagrams illustrate object interactions by looking at t
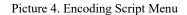diagram is a step-by-step picture, including when it comes to displaying ol

Gambar 3. *Sequence Diagram*

Application Coding

At this stage all system pages are given a script so that all are connected and carry out their functions as planned. In coding or providing scripts using the C # language in Microsoft Visual Studio.

Picture 5. Main Menu Display

Display Menu About

At this stage is a menu display about explaining the use of VR learning applications for the introduction of national heroes, namely as a means of educational media to introduce Indonesian national heroes.

Picture 6. Display of the About Menu
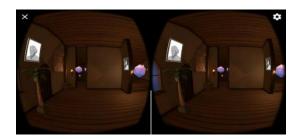
Display Menu How to use

This How to Use menu is a menu used for an explanation of how to use the national hero recognition VR application. Also explained how to point the camera to teleport and how to display 3D hero models along with information.

Picture 7. Display Menu How to use

Display Virtual Reality Mode

In the VR mode display, it displays a Virtual museum as if the user were in a museum.

Picture 8. Display of Virtual Reality Mode

3D Hero Model Display

In this 3D hero display, it displays a 3D national hero object along with a brief explanation through audio and a brief explanation through writing.

Picture 9. Display of the 3D Hero Model

Display of Exit in Virtual Reality National Heroes

In the picture below is the menu display exiting the national hero Virtual Reality and returning to the main menu.

Picture 10. Display of Exit in Virtual Reality of National Heroes

Testing

Testing is the stage in the development method of the prototype method. At this stage the system is ready to be tested. One of the testing methods used is Usability Testing. Usability testing is a technique used to evaluate products by testing it directly on the user. Usability testing is an attribute to assess how easily the website interface is used. Usability has five very important components namely (1) learnability, how easily users can complete basic tasks when they see a design. (2) Efficiency, after they learn about design, how quickly they can complete these tasks.
(3) Memorability, after users no longer use the website, how much do they remember finding the website again (4) Errors, how many mistakes were made by users, how severe these errors are, and how they correct those errors. (5) Satisfaction , looking for designs that have been made fun for users [8]. Usability testing aims to find weaknesses in the interface design that is in a software. This method involves a small group of evaluators to test and assess the interface based on established heuristic principles. The process resulted in 12 heuristic principles that can be used to evaluate the reusability of VR applications. The resulting heuristic principles are as follows:

1.   Natural engagement (Interaction approaching user expectations);

2. Compatibility with the user's tasks and domain (The virtual environment and behavior of each object are similar to the original);

3. Natural expression of action (Gives freedom for users to interact and explore naturally);

4. Close coordination of action and representation (real representation without any lag on the display);

5. Realistic feedback (Feedback from user interactions can be seen quickly and in accordance with user expectations);

6. Faithful viewpoints (Visual representations of the virtual world can adjust the user's normal perception and changes in the point of view by head movements not causing

delay);

7. Navigation and orientation support (Users know where they are in the virtual world they enter);

8. Clear entry and exit points (can enter and exit the virtual world easily);

9. Consistent departures (the consistency in the representation of objects);

10. Support for learning (the object shown can provide insight / learning for users);

11. Clear turn-taking (there is a turn in communication time. This principle only exists in a virtual environment where the avatar the user uses can interact with other avatars);

12. Sense of presence (the user's presence in the virtual environment in which he enters should be as real as possible).

The initial step of usability testing is to give questionnaires to 20 respondents consisting of Esa Unggul University students and given guidance as in the appendix. In making the questionnaire involved the usability aspect in order to obtain the data to be achieved in this test.

Data analysis techniques using a Likert Scale. Likert scale can be used to measure attitudes, opinions, and perceptions of a person or group of people about social phenomena which is a bipolar continuum scale, at the left end (low number) illustrates a negative answer. While the right hand end (high number), describes a positive answer.

Table 2. Value Table

PK	STS	TS	CS	S	SS
NILAI	1	2	3	4	5

Information

PK	: Pertanyaan Kuisioner	CS : Cukup Setuju
S	: Setuju	
STS	: Sangat Tidak Setuju	SS : Sangat Setuju
TS	: Tidak Setuju	

Based on the tasks done by the user and writing down the questionnaire that was filled out by 20 respondents, it can be seen in the table below:

The following is an average of each questionnaire calculated from each statement:

Table 3 Table Average

No	Question	Average value
Natural Engagement		
1.	Interaction in VR as you expect.	79%
2.	Virtual reality National Heroes are easy to understand as expected.	74%
Compatibility with the User's Task and Domain		
3.	The user interface display in virtual reality is clear and easy to understand.	73%
4.	The virtual environment and behavior of each object are similar to the original.	80%
Natural Expression of Action		
5.	Virtual reality National Hero Introduction gives you freedom to interact and explore learning naturally.	84%
Close Coordination of Action and Representation		
6.	Real representation without lag on display.	69%

7.	Real representation without buttons that don't work.	77%
Realistic Feedback		
8.	Feedback from your interactions can be seen quickly and according to expectations (response).	73%
9.	Feedback when directed to each button can give a response of.	77%
Faithful Viewpoints		
10.	Visual representation on the virtual world can adjust your normal perception and changes in perspective by head movements do not cause delay.	74%
Navigation and Orientation Support		
11.	You know where you are in the virtual world that you enter.	76%
12.	The functions and features provided are clear and easy to understand.	80%
13.	Text writing used in Virtual reality is easy and clear to understand.	70%
14.	Buttons on virtual reality are easy to understand.	78%
Clear Entry and Exit Points		
15.	You can easily enter and exit the virtual world	82%
Consistent Departures		
16.	Consistency in object representation	78%
Support for Learning		

17.	The objects shown can provide insight / learning using virtual reality for you.	79%
18.	learning with Virtual reality The introduction of a National Hero can add interest in learning for students.	81%
Sense of Presence		
19.	Your presence in the virtual environment being entered feels real	82%

Table 4. Percentage of Values

Answer	Information
0% - 19.99%	Sangat (Tidak Setuju, Buruk atau Kurang Sekali)
20% - 39.99%	Tidak Setuju atau Kurang Baik
40% - 59.99%	Cukup atau Netral
60% - 79.99%	Setuju, Baik atau Suka
80% - 100%	Sangat (Setuju, Baik, Suka)

The value calculation uses the value scale table in table 4.9. each answer given by the respondent has a value of each. Example of calculating value:

Questionaire 1:

1) Respondents who answered strongly agree (5) = 1 x 5 = 5

2) Respondents who answered agree (4) = 16 x 4 = 64

3) Respondents who answered neutral (3) = 3 x 3 = 9

4) Respondents who answered disagree (2) = 0 x 2 = 0

5) Respondents who answer are not

very agree (1) = 0 x 1 = 0

Total Score = 5 + 64 + 9 + 0 + 0 = 78

To get the results of interpretation, first you must know the highest score (X) and the lowest number (Y) for the assessment items using the following formula:

Y = Highest score Likert x number of respondents (Highest score 5) "Pay Attention to Value Weight"

X = lowest Likert score x number of respondents (Lowest Number 1) "Pay Attention to Value Weight"

The highest number of scores for the **VERY AGREE** item is 5 x 20 = 100, while the **VERY NO AGREE** item is 1 x 20 = 20. So, if the total score of the respondent is 78, the assessment of the respondents' interpretation of the learning media is the result of the resulting value by using the% Index formula.

Formula Index% = Total Score / Y x

100%

Then the final settlement of the case examples:

= Total Score / Y x 100%

= 78/100 x 100%

= 78% = 78% **GOOD** category **Conclusions and suggestions Conclusion**

Conclusions from the test result data in solving problems from identifying problems faced by the teacher when explaining lessons concerning the history of students are easily bored, the solution in handling it is to create a learning process that is fun and not bored by making the delivery of information can be delivered more interactively and feels more obvious example is VR technology. The goal is to achieve a strong sense of presence in the virtual environment. Especially in the classroom, with that technology can be utilized in the classroom that is Virtual Reality Recognition of national heroes.

Suggestion

The development of the Virtual Reality system for hero recognition can be developed by adding several features such as creating a quiz, adding several other hero figures, improving the appearance, speed of access, and application design

is also needed to increase the performance and usefulness of this application.

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