Mountaineering Educational Game Using RPG Maker XP

Heri Purwanto[1], Didin Saepudin[2], Rikky Wisnu Nugraha[3], Rudy Sofian[4], Fahmi Reza Ferdiansyah[5], Shaina Gwynneth Nethania[6], Edi Andriansyah[7]

heri.purwanto@usbypkp.ac.id

Abstract. Indonesia, an archipelago located on the Asia-Pacific Ring of Fire, has many mountains that attract many tourists, especially mountain climbers. The high interest in mountain climbing is also accompanied by increasing cases of mountain climbing accidents. To reduce the number of mountain climbing accidents, there must be educational efforts, one of which is through games. This research focuses on making a mountain climbing educational game using RPG Maker XP with the Agile Scrum method. The test results show that this game has run well, as seen from the valid testing results, and questionnaire testing involving 15 respondents shows that this mountaineering educational game has met the criteria, namely interactive 82.6%, easy to use 81.3%, game content suitability 86.6%, positive feedback 89.3%, and user experience 84%, resulting in an average percentage of 82.2%. From these results, the game could be an effective way for education in preventing mountain climbing accidents.

Keywords: Educational game, Mountaineering, Agile, Scrum

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1 Introduction

Indonesia is an archipelago located in the Pacific ring of fire and thus has 13% of the world's volcanoes, namely: 129 active volcanoes and 500 inactive volcanoes [1] With the large number of mountains in Indonesia, this is an attraction for tourists, especially for mountain climbers to enjoy the beauty of nature [2]. One of the sports activities in nature that is favored by various groups of people is mountain climbing. According to data from the Indonesian Mountain Guides Association (APGI) in 2020, there are approximately 3 million domestic mountain climbers and 150 thousand foreign tourists who climb mountains in Indonesia [3]. Mountain climbing provides positive benefits in channeling interests and talents and increasing awareness of nature and the surrounding environment [4].Mountain climbing is not an ordinary sport so every climber must have strong mental and physical endurance and understanding of the natural environment [5] Some cases of mountain climbing accidents such as lost or lost on the mountain, injury, hypothermia or leading to death are numerous [6] Based on data collected by the National Search and Rescue Agency (BASARNAS), there was an increase in cases of mountain climbing accidents from 2015-2019. In 2015, there were 12 accidents on Mount Semeru, East Java. Then, the number of mountain climbing accidents increased in 2016 and 2017 to 30 cases. In 2018, the types of climbing accidents were dominated by climbers who got lost, recording 16 cases. In early 2019, another climbing accident occurred in which three young climbers died on their way to the summit of Mount Tampomas [7]In August 2020, a 16-year-old climber was found dead on Mount Bawakaraeng, South Sulawesi due to hypothermia [8] This happens because of the lack of information about the mountain to be addressed, be it the climbing route, education about the preparation of mountaineering that is sober, and the climber's understanding of first aid efforts is still layman [9]. From the above problems to reduce the number of mountain climbing accidents, there must be educational efforts to climbers, including with educational games. Educational game is a game designed to provide learning experiences to its target users ranging from children to adults [10]. The purpose of this educational game is not only as entertainment but also to increase knowledge, skills, and understanding on various educational topics and concepts according to their use in certain educational contexts [11]. The general characteristics of educational games usually involve elements of educational purpose, interactive, adaptive, positive feedback, and content of the game [12].

In previous research, education through games has been used as a medium of learning in schools [13], introduction to arts and culture [14], training mathematical reasoning skills [15], introduction to foreign languages [16], [17], introduction to rare animals [18]. The technology and game development methods in making games used RPG Maker MV [19], Educandy Application [16], ADDIE with stages of analysis, design, development, implementation, and evaluation [20], MDLC known as the Multimedia Development Life Cycle [21],waterfall method with stages of requirements, design, implementation, verification [22], DDD-E with stages of decide, design, develop, evaluate [23]. In previous educational game research related to mountain climbing by Wicaksana [24] using finite state machine RPG Maker modeling with the aim of providing awareness of standard operating procedures (SOP) in climbing Mount Semeru. The result of this research is an educational game simulating the operational standards of climbing Mount Semeru where the game character must find items and survive. Research from Munawar [25] in the form of a climbing adventure simulation game using cocos 2d-x programming based on a two-dimensional android game engine. The stages used in this research are ADDIE (analysis, design, development, implementation, evaluate). Based on the above studies, it can be seen that educational games related to mountaineering are still rarely discussed. Therefore, the contribution of this research is the creation of a mountaineering educational game for climbers, especially beginners using RPG Maker XP with the scrum method. The advantages of using RPG Maker XP are having a user friendly interface, easy to use, high development flexibility, lightweight, and easy game resolution settings [26]. The purpose of this research is to prevent and minimize the number of accidents during mountain climbing by understanding basic education about climbing which is conveyed informatively through this game.

2 Method

This research uses a software development approach using agile methods, specifically scrum, in the process of making RPG Maker XP-based educational games. The agile method was chosen because of its flexibility that allows adjustments to changing needs and updates that may occur during development. Agile Scrum is a lightweight framework that aims to improve predictability and risk management using an iterative and incremental approach [27]. The Agile Scrum method has several stages as follows: 1) product backlog, which is when user requirements are grouped into a list of features that must be completed according to the estimated time. 2) The sprint planning stage begins with the selection of the product backlog to be implemented. 3) sprint is a limited period of time in which developers work to complete the tasks selected during sprint planning. 4) daily scrum meeting is a daily meeting conducted by the development team to observe the progress of the task, resolve obstacles, and plan the next action. 5) sprint review and restrospective is conducted to evaluate the results achieved and plan future

improvements [28]. The stages of the Agile Scrum method can be seen through the image below

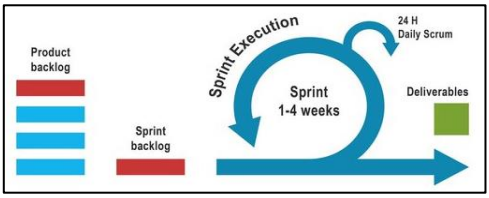

Fig 1. Agile Scrum Method

3 Result And Discussion

Mountaineering educational games have the purpose of educating mountain climbers, especially beginners, about the things that must be prepared when climbing mountains. In this game design, we will discuss the scrum stages passed by the team and also modeling using use case diagrams, use case scenarios, activity diagrams, and class diagrams.

A. Stage of Scrum

At the product backlog stage, identification is carried out in the form of needs and elements [29] in making mountain climbing educational games as shown in the table below.

Tabel 1. Product Backlog

No	Elements List	Priority
1	Use Case Diagram	1
2	Use Case Scenario	2
3	Activity Diagram	3
4	Class Diagram	4
5	Mockup Design	5
6	Game Making	6
7	Testing	7
8	Questionnaire	8

The team will proceed to the sprint planning stage, selecting elements for a mountaineering educational game. The sprint stage involves implementing these elements within a month or less, with daily scrum meetings. The sprint review and restrospective stage involves blackbox testing and questionnaire testing to ensure the game meets educational needs and runs as planned.

B. Game Implementation Proses

Use case diagram is a representation of the interaction between actors and the system to find out the relationship between the two [32]. The following is the Use case Diagram and Use case Scenario of the RPG Maker XP mountain climbing game.

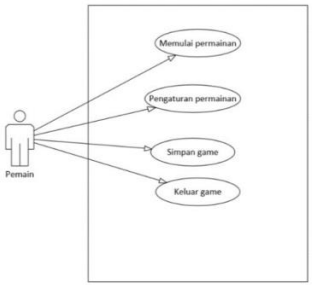

Fig. 2. Use Case Diagram Game

In the use case diagram above, it can be seen that the player as an actor will perform several interactions such as starting the game, playing the game, stopping or exiting when the game is running, and finally the player can make settings in the game. After making a use case diagram, a use case scenario is made. Use case scenario is a description of the sequence of steps taken by actors in a system [33]. The use case scenario for starting the game can be seen in table 3 below which explains how the player starts the game starting with start and selecting game options such as play, continue, and exit game.

Table 1 Gane Stary Scenario

Title	Players start the game
Description	Player starts the game and enters the start screen
Aktor & Interface	Actor: Player Interface: Start page
Pre-condition	Player presses any button to sign in
Basic Flow	a. Player opens the game b. Players press the start button or any button c. If the button has been pressed then will go to the page to choose play new game or continue game or save game
Post-Condition	Player has successfully entered game
Alternative(s) Flow	Player failed to enter the game

The game offers various scenarios, including start, playtime, stage, exit, and game settings. Players can choose to start or resume a saved game, choose a stage, stop or exit, and adjust graphics, audio, and controls.

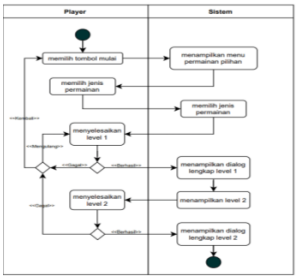

Fig. 3. Activity Diagram Start Game

Activity Diagram is a diagram that describes the flow of activities from start to finish and the possible decisions in it[34]. In Figure 3 shows that when the player presses the start button, the system will display the game menu options that can be selected by the player. After that, the player will start completing challenges at the level. During the game process, the system will also display an educational dialog. After the player successfully completes level 1, it will continue with the next level but if it fails, the player is required to repeat from the beginning of the game.

Fig. 4 Mockup Karakter Game

The mockup of the mountain climbing educational game interface includes the initial display when the game is run and the display in the game.

The following are the results of the implementation of the mountain climbing educational game using RPG Maker XP

Fig. 5. Educational Game View

In the initial view of the educational climbing game in Figure 4, there are 3 options, namely a new game to start a new one, resume a game that has been saved or played previously, and shutdown to end the game. When a player chooses a new game option, it will be directed to the next screen that brings the welcome dialog to the climbing game for the player.

The game will be directed to 2 options, namely beginner or already climbing, where a player must choose one of these options. When the player chooses the first option, i.e. the beginner, the game view will display an educational dialog about the preparations to be made before climbing the mountain is done. On the next display, potential climbers are also asked to bring a garbage bag to preserve the natural environment during the climb.

Besides, the player will enter the mountain climbing story prefix. Here, the player will have a dialog with other game characters such as acquaintance and also enter the name of the character. Then, the game will feature a challenge at the first level, namely in the form of an invitation to pick up garbage to protect the natural environment during mountain climbing. Finally, the game will feature the first level challenge, namely picking up garbage as shown in Figure 13.

Fig. 6. Level 1 Challenge View

The player is asked to pick up the garbage and store it in the trash bag until a certain score is met and can proceed to the next level.

After this mountaineering educational game is implemented, the next step is to conduct a test, namely in the form of blackbox testing and distributing questionnaires. Blackbox testing is testing by observing the input and output results on the software. In blackbox testing this mountain climbing educational game between the test case and the expected results have run well which can be seen in the table 2 below.

Table 1 Black Box Test Results

Modul	Test Scenario	Expected results	Testing
Button new game	Press the new game button	Enter the game	Valid
Button exit game	Press the exit game	Exit the game and closed applications	Valid
Analog character to the left and right	Move characters to the right and left	Successfully move characters with analogues to the Left and Right	Valid
Analog characters up and down	Moving characters on top and down	Successful move character with analog to the top and bottom	Valid
Input character name	Entering character name	Succeeded entering character name	Valid
Game start Dialog	When 2 characters meet will appear game start dialog	Successively display dialogs game start	Valid
Challenge	Join the game	Succesfully enter the game	Valid

In the questionnaire testing of this game was carried out by giving 10 questions with a Likert scale of 1-5 to mountain climbers which included interface appearance, positive feedback, interactive, game content, ease of use, and the flow of the game in it can be seen in table 8 below

Table 2 Question questionnaire

No	Question
1	Is the design and appearance of the mountain climbing game interesting?
2	Is the mountain climbing game understandable?
3	Is the education in the game delivered well?
4	Are mountain climbing educational games interactive?
5	Does this game give you positive feedback?
6	After playing this mountain climbing game, are you interested in playing it again?
7	Do users enjoy mountain climbing games?
8	Is this game easy to play?
9	Is the learning experience through this mountain climbing game fun?
10	Did the contents of this climbing game match the information required by the climbers?

This questionnaire involved 15 respondents with an average result of 82.2% in the very agree assessment category. The results of this percentage indicate that the mountaineering education game has a good user experience and can be the right education for mountaineers. The percentage results of each question can be seen in table 3 below

Table 3 Percentage result for each question

Question	Percentage Value (Y)
1	78.6%
2	78.6%
3	82.6%
4	82.6%
5	89.3%
6	77.3%
7	84%
8	81.3%
9	81.3%
10	86.6%
Average	82.2%

4 Conclusion

The results of the research "Mountaineering Educational Game Using RPG Maker XP can provide a new experience related to mountaineering education. Through the game that has been created, each player can find out the preparations needed before mountain climbing by presenting several challenges that must be solved by a player. The results of blackbox testing on this mountaineering education game show that the game has run according to the expected results. In questionnaire testing with 10 questions and involving 15 respondents, it shows that this mountaineering educational game has met several criteria, namely interactive 82.6%, easy to use 81.3%, game content suitability 86.6%, positive feedback 89.3%, and user experience 84% resulting in an average percentage of results of 82.2%. Suggestions for research related to mountaineering educational games are to make the game flow more interesting with more challenging game levels and re-design the game interface.

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