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An Analysis of Game Difficulty in "Game Panjol"

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ORCID:Tutik Khotimah: <http://orcid.org/0000-0003-2516-3431>**Abstract**

"Game Panjol" is an educational game that was developed by the researchers of this study. The educational theme discussed in this game is the diversity of ethnic groups and cultures in Indonesia for fourth grade elementary school students. This adventure game has a mission to save friends from different tribes and cultures. The purpose of this study was to determine the difficulty of this game. First the game difficulty was identified from the point of view of the game designers. Next, the game was tested with respondents and its difficulty was analysed from the players' perspective. From the point of view of the game designer, this game is divided into 3 levels, which are easy, medium, and hard. The difficulty levels is based on the number and weight of obstacles in the game. From the point of view of the game player, the difficulty level is determined by the number of times their attempts are successful, how long it takes to finish, how many coins are earned, and how many friends are saved. For the 14 respondents, the success of the rescue mission at each level was 100%, while the collection of coins at easy, medium, and hard levels was 88.124%, 89.881%, and 80.382% respectively. Based on the comparison between the average number of trials and the maximum number of trials, each level is 20.476%, 28.151%, and 30.357%.

Keywords: adventure, education, game

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1. Introduction

The rise of smart phone use among children is the reason for the importance of educational facilities through smart phone in game form according to their age [1, 2]. Therefore, an educational game is needed [3]. Combining education and games can improve player educative skills in a fun way [4]. Some educational games use game difficulty to attract and challenge the interests of their users [4–6]. In fact, all games consist of challenges or obstacles [7].

One example of an educational game that has been developed by the authors is *Game Panjol* [8]. The educational theme discussed in this game was the diversity of

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ethnic groups and cultures in Indonesia for fourth grade elementary school students. The teaching material in it contains local wisdom in the East *Pantura* area. This game is in the form of adventure with the mission of rescuing friends from other tribes who are captured by the enemy. The main character of this game is *Panjol* who is a Javanese origin. Armed with *Keris* weapons, *Panjol* carries out its mission.

The game of *Panjol* consists six levels. At the odd level, namely the first level, third level, and fifth level, there are material on the diversity of othnic groups and cultures which are equipped with quizzes that must be answered in order to unlock the next level. While at the even level, namely the second level, fourth level, and sixth level are an adventure-based game with a rescue mission. On this mission, the values taught are *rukun* and *tulung-tinulung* [9]. The level selection image in the *Panjol* game can be seen in Figure 1



Figure 1: Level Selection

This *Game Panjol* also consists of obstacles in several levels of game difficulty. The difficulty level of the game is an important area in game level design for the effectiveness of the game in producing an interesting experience for the players [5]. Rich and interesting game levels are a key component of a successful game [10].

This study aims to analyze the level of difficulty in the *Panjol* game. This analysis is necessary because if the game is too easy or too difficult, it can reduce player motivation and time on the task [11]. From the point of view of the game designer, the difficulty level of the game is determined by puzzles, uncertainty, game speed, number of enemies, and time limits [12]. Whereas from the game player's point of view, the level of difficulty is described as the effort needed to complete the mission [11]. In this study, the effort was seen from the value produced, the time needed, and the number of failures experienced until the mission succeeded.

2. Research Method

The research begins by identifying the difficulty level of the game from the point of view of the game designer. This identification is done by analyzing the components of the level of difficulty that exists in the *Panjol* Game. After that, identify the difficulty level of the game from the player's point of view. What is done in this case is asking the respondent to play the *Panjol* game until it reaches the finish for all levels. From this experiment, it was recorded how many times the player experienced game over before the player managed to carry out the mission to reach the finish. In addition, the length of time needed to reach the finish was also recorded. Coin scores and rescue scores are also recorded to compare the percentage of mission success. The amount of game over and the length of time needed to reach the finish is used to analyze the level of difficulty of the *Panjol* game. The research method is shown in Figure 2.

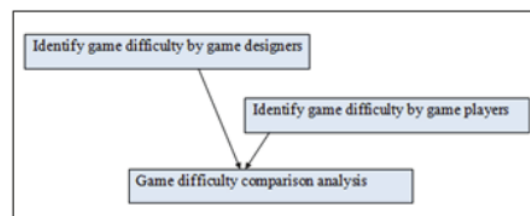


Figure 2: Research method

3. Result and Discussion

3.1. Concept of Game Panjol

The success of carrying out the mission on the *Panjol* Game is influenced by three main components, namely the number of coins obtained, the number of friends saved, and surviving obstacles. Coins and saved friends will add scores, but obstacles will cause a player to experience game over. The concept of mission success in the Game *Panjol* can be seen in Figure 3.

3.2. Difficulty Levels on Game Panjol

Game Panjol consists of three levels of difficulty: easy, medium, and hard.



Figure 3: Friend rescued mission concept of Game Panjol

a. Easy Level: At this level, the adventure starts from the yard of the main character's house, Panjol, against the background of a Javanese traditional house during the daytime. The page level display is easily indicated on Figure 4.

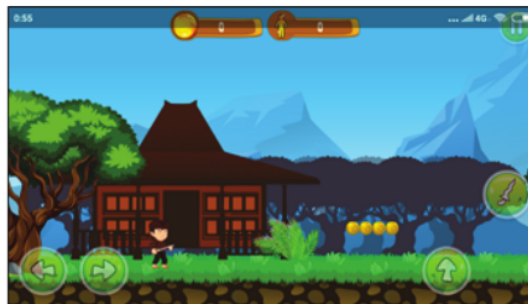


Figure 4: Easy level of Game Panjol

b. Medium Level: At this level, the adventure starts in the last place Panjol at an easy level. This level is illustrated by the background in the afternoon. The page level display is being shown on Figure 5.

c. Hard Level: At this level, the adventure begins in front of the Javanese traditional house yard. This level is depicted with a background at night. The page level display is difficult to show on Figure 6.

3.3. Obstacle on Game Panjol

From the point of view of the game designer, the level of difficulty on the Game Panjol is built on the number and weight of obstacles. There are four kinds of obstacle

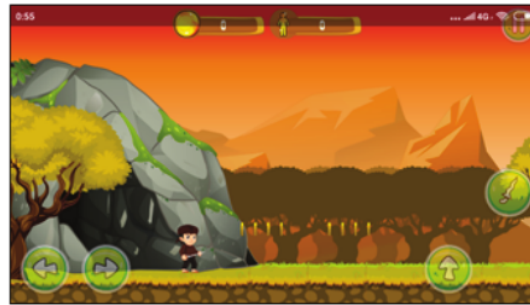


Figure 5: Medium level of Game Panjol



Figure 6: Hard level of Game Panjol

categories with different weights. Obstacles in the form of nature, are consisting of rivers, ravines, mud, and shooting stars. Obstacles in the form of wild animals consist of birds, ferrets, and wolves. Obstacles from enemies in the form of humans are divided into two types, namely enemy 1 is rather dangerous and enemy 2 is very dangerous. Man-made obstacles are in the form of spears, bullets and prisons. Table 1, 2, and 3 show obstacles at easy, medium, and hard levels.

TABLE 1: Obstacle on easy level

Type of Obstacle	Weight	Easy Level	
		Amount of Obstacle	Difficulty Level
River	0,2	3	0,6
Revine	0,3	5	1,5
Mud	0,15	1	0,15
Bird	0,1	5	0,5
Spear	0,45	4	1,8
Jail	0,4	4	1,6
Enemy 1	0,5	4	2
	Total	26	8,15

TABLE 2: Obstacle on medium level

Type of Obstacle	Weight	Medium Level	
		Amount of Obstacle	Difficulty Level
River	0,2	1	0,2
Revine	0,3	2	0,2
Bird	0,1	1	0,1
Wolf	0,925	1	0,925
Spear	0,45	2	0,9
Jail	0,4	4	1,6
Enemy 1	0,5	1	0,5
Enemy 2	0,9	4	3,6
	Total	16	8,425

TABLE 3: Obstacle on hard level

Type of Obstacle	Weight	Hard Level	
		Amount of Obstacle	Difficulty Level
Shooting Star	0,7	5	3,5
Revine	0,3	3	0,9
Bird	0,1	4	0,4
Wolf	0,975	1	0,975
Spear	0,45	16	7,2
Shot	0,9	3	2,7
Jail	0,4	4	1,6
Enemy 2	0,9	5	4,5
	Total	41	21,775

3.4. Maximal Score on Game Panjol

Scores on Game Panjol are influenced by the number of coins that were successfully taken and the number of friends who were saved. There are obstacles in this game that only determine game over or not. Score values at each level are shown in Table 4

TABLE 4: Score on every level

Level	Amount of Coins	Friends Rescued	Max Score	
			Coins	Rescued Mission
Easy	83 Coins	5 People	830	100
Medium	72 Coins	5 People	720	100
Hard	102 Coins	5 People	1020	100

3.5. The Result of the Trial Game Panjol by Players

The Game Panjol has been tested by 14 players ranging in age from 18-24 years consisting of 11 men and 3 women. The results of the trials are shown in Table 5.

TABLE 5: The result of the trial Game Panjol

Level	Category of Assessment	Result		
		Min	Max	Average
Easy	Amount of Trial	1	30	6,143
	Time of Completed Mission in minute	1	15	6
	Score of Coin	100	830	731,429
	Score of Friends Rescued	100	100	100
Medium	Amount of Trial	1	17	4,786
	Time of Completed Mission in minute	2	20	6,071
	Score of Coin	100	720	647,143
	Score of Friends Rescued	100	100	100
Hard	Amount of Trial	1	20	6,071
	Time of Completed Mission in minute	1	20	7,571
	Score of Coin	100	1020	819,286
	Score of Friends Rescued	100	100	100

From the results of the above trials, the success of the rescue mission for each level is 100%, while the average percentage of coins obtained with maximum coins at each level is 88.124%, 89.881%, and 80.382%. However, from the percentage comparison between the number of trials on average with the maximum number of trials each level is 20.476%, 28.151%, and 30.357% while the comparison of the completion time of the average mission with the maximum mission completion time of each level is 40%, 30,357%, and 37,857% for easy, medium and hard levels.

4. Conclusions and Suggestions

From limited scale trials, we conclude that *Game Panjol* is relatively difficult games. To be able to complete the mission properly, the game player must repeat the adventure several times so that the player has a good strategy to complete the mission. This game is suitable to be played by people who like challenges. However, for the use of the age of children, there needs to be an improvement in the level of difficulty of the game. The number and weight of obstacles can be made smaller with consistent comparisons for each level.

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