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THE EFFECTIVENESS OF ANDROID-BASED EDUCATIONAL GAME TOWARD HIGH SCHOOL STUDENTS' PREPAREDNESS IN FACING MERAPI ERUPTION

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ABSTRACT

Background: Mount Merapi has the most active eruption frequency in Indonesia and even in the world, located on the border of two provinces, Yogyakarta and Central Java. Based on this, it is necessary to improve the preparedness program, especially for high school students who are active and productive communities. In improving disaster preparedness, capacity building in the form of sufficient knowledge requires effective educational methods, one of which is educational games. **Aim:** The research objective was to determine the effectiveness of educational games compared to conventional methods for eruption disaster preparedness. **Methods:** This research is a quasy experimental design with a pretest - posttest nonequivalent control group. This study compares the effectiveness of the educational game method with the conventional method, on students' preparedness to face eruptions disaster. The sampling technique was a cluster sample, with a total sample of 42 people in the control group and 42 people in the intervention group who were students at school in disaster prone area. The stages of the research method are starting from the preparation stage which includes game design, software development stage, trial phase, data collection stage, processing stage and data analysis. **Results:** the results show that there is an effect of educational games on the level of knowledge, seen from the *p* value <0.05. **Conclusion:** It is necessary to develop android-based educational media to generate interest and good attitudes towards disaster preparedness in school age children.

Keywords: Educational Games; Disaster Preparedness; Android-Based Education

INTRODUCTION

Disaster is a series of disruptions caused by natural events, human behaviors or a combination of both. The calamities event causes material loss and death as the affected community or society require external coping resources (Amri, 2017). National Disaster Management Authority (BNPB) 2017 reported that disaster risks in Indonesia recent 15 years period from 2002 to 2016 is multiplied by 20 times. One of frequent disaster in Indonesia is mount eruption. About 129 active volcanoes spread along the archipelago, several volcanoes are highly active with a history of large eruption (BNPB, 2017).

Merapi volcano is the most active volcanos in Indonesia. Merapi located on the border of Special Region of Yogyakarta and Central Java province. The volcanos have the most eruption frequency in Indonesia even the world. Eruption mitigation and management is a concern for both the government and the community (Rahayu, 2014). Based on the following hazard, it is necessary to enhance community preparedness at all age group including children, adolescents and adults (BNPB, 2017). One of the initiatives to enhance preparedness is organizing outreach programs using various methods and conducting effective evaluation. Research by Azizah (2018) indicated that monopoly game combined with Merapi volcano eruption as educational contents effective to improve student's knowledge at State Junior High School I Delanggu,

Klaten (Azizah, 2018). Game education developed by Pratama & Rahman (2012), successfully deliver lesson to public associate with appropriate action during mount eruption. However, Pratama and Rahman's game (2012) intended for community member who does not have sole responsibility against public safety in the surrounding area. In terms of disaster response, individual not only expected to save themselves, but also community member, especially vulnerable groups including pregnant women, toddlers and the elderly. Based on preliminary studies, there was no single report identified related to implementation of android-based educational games among high school students in Merapi Volcano disaster area. This research aimed to develop educational game contains Merapi eruption knowledge and information in an android-based application. In-app session compared with conventional methods of disaster education which often offered in peer group. This study evaluated both educational methods effectiveness toward high school students' eruption preparedness.

METHODOLOGY

This is a quantitative research with quasi-experimental study design, making comparison of the control and intervention group. This research implemented pretest-posttest non-equivalent control group design, where the intervention group received education program using android-based game, while the control group is scheduled for online lectures. Before and after treatment, each group participated in a pretest and posttest evaluation to measure student's knowledge and attitude. Android-game developed by researcher in collaboration with external game creator, Manasta Studio. Research team members provided game scenario and quiz items while ensuring the contents appropriate to student's development age. Game creator were producing Android game interface following designated requirements. Population in this study were high school students in Sleman Regency. Research samples were recruited through cluster sampling method, 42 students from two high schools which were located in Disaster Prone Area II and III. Total of 84 students, 42 in each intervention and control group participated in this study. Researcher invited two schools, SMAN 1 Turi and SMAN 1 Pakem from Disasters Prone Area II and III. After they were granted permission from the school, researchers in collaboration with counseling teachers randomly identify students following the inclusion criteria.

RESULTS

Table 1: Respondents Characteristics by Age, Sex, Class and Majors in the Intervention Group (n= 42)

Respondent characteristics		F(n)	%
Age (years)	16	16	38.1
	17	26	61.9
	Total	42	100
Sex	Male	13	30.9
	Female	29	69.04
	Total	42	100
Class	Second year	37	88.1
	Final year	5	11.9
	Total	42	100
Majors	Natural sciences	29	69.04
	Social sciences	13	30.06
	Total	42	100

Source: Primary Data

The age group that dominated study participants were 17 years old (61.9%), more female (69.04%) than male, second year students (88.1%) and majoring in natural sciences (69.04%).

Table 2: Respondents Characteristics by Age, Sex, Class and Majors in the Control Group (n=42)

Respondent characteristics		F(n)	%
Age (years)	16	13	30.9
	17	22	52.3
	18	6	18.7
	19	1	2.3
	Total	42	100
Sex	Male	11	26.2
	Female	31	73.8
	Total	42	100
Class	Second year	14	33.3
	Final year	28	66.7
	Total	42	100
Majors	Natural sciences	26	61.9
	Social sciences	16	38.1
	Total	42	100

Source: Primary Data

The age of majority of control group is 17 years (52.3%), dominated by female (73.8%), final year students (66.7%) and majoring natural science (69.9%).

Table 3: Pretest Results in the Intervention Group (n=42)

Score	F (n)	%
5	6	11.90
6	1	14.29
7	2	16.67
8	4	19.05
9	6	21.43
10	1	23.81
11	4	26.19
2	3	4.76
13	2	30.95
14	5	33.33
15	8	35.71
Total	42	100

Source: Primary Data

Table 3 presented that 8 students (35.71%) achieved highest score (15) in the intervention group.

Table 4: Pretest Results in the Control Group

Score	F (n)	%
6	2	4.8
7	4	9.5
8	4	9.5
9	10	23.8
10	7	16.7
11	4	9.5
12	8	19.0
13	3	7.1
Total	42	100

Source: Primary Data

Based on Table 4, 3 students (7.1%) in the control group achieved highest score (13).

Table 5: Mean Pretest and Post Test Scores in the Intervention Group (n=42)

	Mean (SD)	95% CI
Pretest	10.04	5.38-14.7
Post test	12.65	7.82-15.0

Source: Primary Data

Table 5 indicated mean difference in the intervention group. Post test scores increased after playing educational games.

Table 6: Mean Pretest and Post Test Scores in the Control Group (n=42)

	Mean (SD)	95% CI
Pretest	9.9	8.04-11.76
Post test	15	15

Source: Primary Data

From the above table, mean difference identified in the control group. An increase in the post test score was observed in this study.

Table 7: Paired T Test Results of Intervention Group (n=42)

	Mean (SD)s	Difference (SD)	95% CI	P value
Pretest	10.04	1.85	-3.43-(-1.78)	0.000
Post test	12.65			

Source: Primary Data

Table 7 reported that educational games affect student's level of knowledge in the intervention group, with p value <0.05.

Table 8: Analysis Results in the Control Group, Paired T Test (n=42)

	Mean (SD)s	Difference (SD)	95% CI	P value
Pretest	9.9	5.09	-5.67-(-4.5)	0.000
Post test	15			

Source: Primary Data

Above table inferred that educational games provide effect to the control group level of with p value <0.05.

DISCUSSION

Disaster preparedness management based on BNPB (2017) generally classified into five stages: planning, preparation, implementation, evaluation and follow-up. Provision of planning includes the activation of sirens and evacuation that involve neighborhood housings, offices, schools and public area. Planning needs to identify objectives, goals, execution time, hazards, preparedness drill scenario, standard procedure evaluation and establish shelter. Planning also required disseminate disaster management contents.

Various counseling methods suitable to be implemented for individual or peer group. Applied educational media supposed to evade uninteresting experience, game for example. Preparation stage including discussion to finalize desired educational plans, choosing poster or leaflet handout for public consumption, setting up the building and supporting equipment, map directory installation, evacuation route and assembly point. Implementation stage includes warning sign, response and documentation.

Several studies have been focused to enhance school age student's preparedness. One of the available efforts is organizing educational program using various methods and evaluate the preparedness. A study conducted by Pitang, Irman & Nelista (2019) reported association between disaster training and enhanced preparedness at the event of catastrophic volcano

eruption among elementary school children. Current pandemic situations expect community to apply physical distancing as the traditional learning is at risk for virus contamination. Safe and affordable alternative methods are required to achieve learning outcomes.

Several studies suggest that educational games have been effective to increase knowledge, interests and attitudes at school age. Educational game widely known as edutainment, a computer-based education game that easily recognized by the structure of rewards. The game clearly apart from educational experience (Egenfeldt, 2015).

The purpose of an educational game is to provide experience for players so that they are able to be involved and are motivated by the game objectives (Nama & Arnoldi, 2016). Pratami, Ayu & Saputra (2017) reported that crossword knowledge puzzle is effective to increase students' interest in learning natural science. Educational games are also effective to improve students' knowledge regarding anemia in elementary school according to Titisari, SiT & Gizi (2019). A game developed by Pratama & Rahman (2012) indicated that structured educational program deliver knowledge to the community regarding appropriate action in a volcano eruption. However, Pratama & Rahman (2012) endorsed that the game players were not responsible for public safety. In a catastrophic event, saving as many lives is important as people encouraged to not only focused on individual but also communal safety, moreover toward vulnerable population.

Based on this research, high school students' knowledge increased after receiving disaster preparedness using educational games. This is indicated by the number of correct answers after participating in educational games. It can be concluded that educational games produce effects on the high school students' knowledge. Individual's level of knowledge is influenced by age, media, socio-culture, economy, environment and personal experience. Young generations have better level of knowledge in terms of technology device operationalization as it promotes children to retrieve information. Gadget is one of the popular communication devices for teenager which support feature for game installation.

Amid COVID-19 pandemic, distance learning emerged as a feasible teaching method for students in every level of study. Gadget being a dominant device to access the learning contents from online sources. Recently, educational game has gain popularity since previous studies has reported effectiveness in improving student's knowledge and achievement (Pratami, Ayu & Saputra, 2017) research. Implementation of game-based education increase students' knowledge regarding anemia (Titisari, SiT & Gizi, 2019). Game is an effective media to deliver learning material as well as develop students' motivation to learn. Higher students' motivation leads to exciting study experience which results in learning effectiveness and efficiency. Increasing trends of educational game implementation provide various benefits like, encourage students to sharpen their way of thinking, boost creativity and offer opportunity to practice decision making, developing reading, mathematical skills and problem solving.

CONCLUSSION

Based on the result of the above study, it can be concluded that obtained there is an influence of educational games on the level of knowledge, judging from the $p <$ of 0.05.

Conflict of Interests

The authors declare that they have no conflict of interest.

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