Elementary School Students' View to the Educational Game for Children's Awareness of Disaster

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Abstract: Located near to the equator, Bandung—the capital city of West Java province—have high rainfall. This city has been struggling to minimise floods that often occur every year. It was caused by the bad citizen's behavior, such as, not sorting garbage, littering and throw trash into the river. In addition, Bandung also vulnerable to the earthquake that might be occurred due to the shifting of Lembang plate. On the other hand, the ownership of smartphone in Indonesia has been raised year by year. It is no exception for elementary school-age children because there is no strict rule from school to limit the smartphone use. According to the problem, the used smartphone among primary school children should be maximised not only for supporting formal education but also for informal learning. This paper presents the preliminary study of children's awareness of disaster. The aim of the study was to gauge the students' perspective on the use of the smartphone as a mobile game gadget for learning disaster awareness. 12 students of elementary school involved in the various ways of learning disaster awareness. The result of the study shows that the younger students (grades 1-2) tend to enjoy learning disaster preparedness by the storytelling, the older students (grade 6) satisfied by reading the written article. But the average of students (grades 3-5) most interest to learn disaster awareness content through an online game. However, the majority of students felt that mobile game gives more engagement than others learning way.

Keywords: students' view, educational game, children's awareness, disaster, elementary student

1. Introduction

Bandung is the capital city of West Java Province, Indonesia. It is located in a valley formed from a dried ancient lake (Dam, 1996) However, because of the valley is in the Lembang plate. Hence Bandung is still vulnerable to have a big earthquake disaster. National agency of catastrophe releases a public warning that resident near to the Tangkuban Prahu volcano to be aware to the earthquake caused by shifting of Lembang plate any time. In addition, Bandung is located in the equator caused this city received a high intensity of the rain. Hence, year after year Bandung has been struggling to anticipate the flooding disaster. However, the behavior of citizen is crucial for the city to struggling in the flooding disaster.

On the other hand, the ownership of smartphone among children in elementary school (ES) in Indonesia tend to high compared to other countries. Without strict limitation, a student of ES can have a high-end technology of smartphone. Hence, they mostly used such smartphone for gaming. With this trend, student tends to use smartphone overtime and give the negative impact for their study (Puspitasari, 2016). Furthermore, to maximise the use of smartphone and with regard to educating the student about disaster preparedness, it is necessary to develop the mobile application supporting the student in disaster education.

This paper explains the qualitative experiment involved students of ES. The investigation aimed to measure the students' perspective of the educational game for children's awareness of

disaster. About 12 students were actively involved in three stages of studies. The first stage was to learn the disaster awareness through the printed material; the second was used online game entitle Game Master of the earthquake and Build A Kit. The third stage was to play online and iOS mobile game in a various disaster situation. The result of the experiments shows that tall students have the same enthusiastic during the first stage of the experiment. A little participant from grade 6 ES more interest to learn disaster by reading the written disaster guide. But all students agreed that using the mobile game; they felt more enjoy to learn disaster awareness.

2. Game preferences, experience, and acceptance in education

The recent study on computer game preferences has progressed to observe the fundamental motivations for individuals express to play computer games. One of exciting aspect is player preference, such as platform and game genre. Some suggestions accommodating such individual differences in game intentions may be essential to uncovering elements that lead to the effectiveness of educational games (Giammarco et al. 2015). Throughout the academic references, there are also some conclusions that games are ultimately motivating and they can be empowered for learning.

There are numerous study has been conducted to gather student gaming experiences and preferences, and their perception of games for the educational purpose. For example, there was a study to observe students' perception about video games in the teaching and learning in the classroom (Bourgonjon et al. 2010). The study involved numerous students in Flemish secondary school. The aim was to examine their acceptance of video games in the teaching process. The results showed that the usefulness and ease of playing games and the potential of learning using games are straightly exaggerated the students' perception of games in the classroom. Karakus et al. studied the playing habits, expectation and high school students' preferences and consideration with regards to computer games. The study involved some Turkish high-school students. It proved that games could be used for delivering the Math and History course, and it was also prominent in developing the mental skill (Karakus et al. 2008). In summary, implementing digital games in education enables students to easily absorb content knowledge through its role plays (Han & Zhang 2008).

3. Method

3.1 Research Questions and Significance

This study aims to collect the qualitative information about students of ES grades 1-6 gaming experiences, their preferences and perspective to the mobile game for learning disaster awareness. The qualitative study was conducted as a preliminary survey of KAFLOO—Kid Awareness to Flooding—a location-based augmented reality game for learning of flooding disaster. By gathering such information, we supposed to gauge the ES students' perspective to the use of game for disaster education.

3.2 Participants

The research selected 12 children in elementary school age. Four children were at the grades 1-2, and the age range of this group were 7-8 years old. Due to the writing ability of the students, we had special treatment for this group. Six children were at the grades 3-5, and the age range of this group were 9-11 years Old. The rest of them were grades 6 of ES with the age range were 12 years old. The gender of students were three females and nine males. They came from the same village but with a different school. Three students were from a full-day school in the religion field conducted learning processes from 7:30 a.m. to 16:30 p.m. It is common that most of the full day schools are based on religion. Beside taught subject such as Math, Physics, Biology and others mandatory subject in the government curricula, such schools need to deliver religion knowledge and believe after the primary subjects. The others are from three public government ES conducted the study from 7:30 a.m. to 12:00 a.m.

3.3 Materials

To conduct the study, we provided two kinds of material. The first material was printed disaster preparedness for kid adopted from the FEMA website (Fema, 2016). The title of this material was Be A Hero! Youth Emergency Preparedness. There were four categories of content. The first category dedicated to the ES grades 1-2. The second category was for ES grades 3-5. The third category was the material for ES grades 6-8 and the rest of the material category was for ES grades 9-12. Because of the experiment only concern to Indonesia educational system that the ES grades were 1-6, hence the experiment just used three categories of material. With the knowledge, awareness, and life-saving skills needed to prepare for a variety of emergencies and disasters, for instance, flooding, lightning, etc. FEMA completed the material with some additional components, such as the instruction and guide of knowledge of disaster, skill to plan the disaster preparedness, etc. The experiment picked up the necessary topics, i.e., the disaster flooding. Hence, we picked-up all the required material for flooding disaster including the primary concern of disaster preparedness as follows. (1) What is an emergency? What is a natural disaster? What are different kinds of emergencies that can impact me? (2) How can I/my family prepare for an emergency or disaster? Am I/is my family prepared? (3) What should I do in an emergency? What are the safe actions in different emergency situations? In addition, due to the language barrier, the instructor interpreted the material on students' needs.

The second material was an online game application for disaster that also provided by FEMA. There were two online game applications on the website. The first game was entitled Game Master, as shown in Figure 1, intended to train kids of a different disaster such as wildfire, tornado, hurricane/blackout, home fire, winter storm, lightning, and earthquake/tsunami. Because of the background of students were living in the residential that vulnerable to the earthquake and flooding, hence we chose the erathquake and tsunami for the experiment. The second online game was Build A kit game. The game was purposed to train kids to have the skill to prepare disaster survival kit. This simple online game only had a various level that encourages kids to collect some stuff needed in a disaster situation.
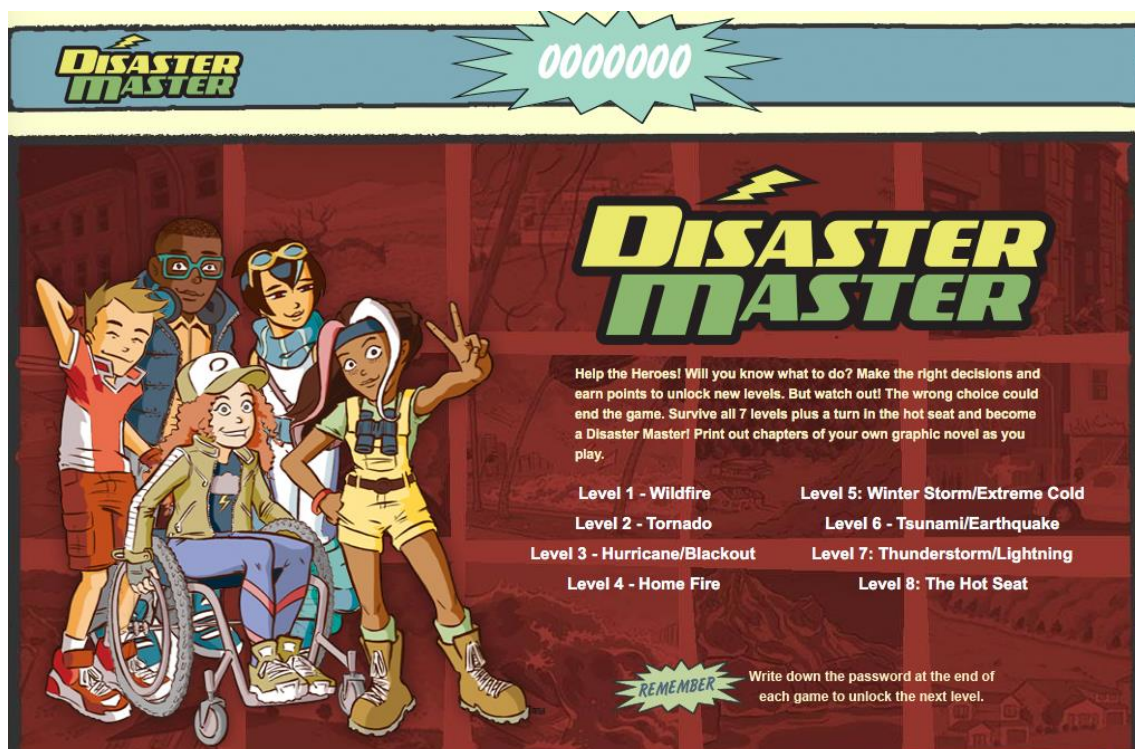

Figure 1. The front page of Game Master on the FEMA website

The third material was a chosen iOS mobile game relevance to the disaster awareness. We prefered a ready game installed on the smartphone, i.e., Emergency HQ game as shown in Figure 2. Beside provided these materials, the study also constructed a set of interview questions about their opinion of learning disaster awareness and their belief to use the game as a learning tool for disaster education.

The fourth material was a set of questionnaire for two purposes. The first purpose was used for interview and discussion after participants completed, and the second purposes was to gather the participants' gaming behaviour, preferences and their perspective to the use of game for disaster education. For gaming behaviour and preferences, the questionnair included some questions of: (1) hours spent for playing the game a day, the most platform of the played game (PC/Mobile or Console game), and type of played game (single or multiplayer).

3.4 Procedure

The qualitative experiment was conducted by grouping the participant into school grade based on the FEMA disaster preparedness curriculum. The first group was four ES students from grades 1-2. The second group was six students from grades 3-5. The rest of the group consisted of two students of grade 6.

At the first stage, both groups congregate in the same place and time to learn and practice the printed material of disaster awareness adopted from FEMA. The first step, the instructor asked the students about the definition of disaster and asked them to mention the variety of catastrophe. The intention of this experiment, i.e., to measure the awareness of student facing a disaster situation based on three curriculums of FEMA disaster preparedness for kids. Then the instructor chose to explain the earthquake as a primary concern. The instructor described that the resident is vulnerable to the massive and big earthquake. It was because of the resident location is in the Sundanese plate that gives a potency of earthquake to 6.8 Magnitude. Hence students should know how to prepare them self when disaster strike. After explained the purpose of the experiment, the instructor continued to read the material with translation. After describing the learning purposes, then the instructor giving the depth disaster material in a storytelling approach. However, for the grade 6, they had the freedom to learn the stuff in by them self. The students spent 30 minutes to understand the definition and type of various disaster. After 30 minutes, the instructor interviews their knowledge of disaster one by one. Each participant had 15 minutes to complete the questions of the understanding of disaster.

The second step was the to deliver the disaster awareness curriculum, especially the topic of what to do in an emergency and knowing how to respond in an Emergency Situation. From the three packets of FEMA disaster material, we chose flooding topics as the study case. As instruction from the article of FEMA, the instructor explained to the student how to identify and demonstrate safe behaviours and steps for how to respond in an emergency situation. Table 1 shows the flooding scenario adopted from FEMA curriculum. At the end of this step, each student was asked to answer the interview question to measure their learning resumes. About fifteen minutes spent to finish all items.

The third step was to involve students playing an online game on the FEMA website and iOS mobile game. Due to the limited device, students play the game one by one. However, for the effectiveness of the experiment, two students played the game in same time. One student played an online game on the laptop, and another student played a mobile game on the iPad. After one game was played the student exchange each other to play another gmae. About 30 minutes spent to play each game. After all step of experiment completed, the instructor interviewed the student one by one to congregate their game references, game behaviours, and perspective of learning disaster preparedness using the mobile game.

3.5 Ethics

Since the study concerned with educational service (not a medical purpose) and involved no risk of harm, formal ethical approval was not required by local regulations in Indonesia. As stated in the method section, participants enrolled in the survey on a voluntary basis. They were informed that information collected using the questionnaires were going to be used for a research study to collect

gaming experiences and opinions, not their performance, and the results would have been reported anonymously.

Table 1

Flooding scenario of FEMA Curriculum of Disaster Awareness for Kids

Disaster Type: Flooding	Introduction: Floods can happen in every state. Flooding occurs during heavy rains when rivers over ow, when ocean waves come onshore, when the snow melts too fast, or when dams or levees break. This is the most common natural weather event. Flooding may be only a few inches of water, or it may cover a house to the rooftop.
Engage!	Have students pretend they are raindrops. When just a few students stand in one area, everything's one. Add more by sending more students to that one area – now you have a puddle. Add more students, and you have a flood!
Inquiry Question	Use these questions to get a discussion started. Have you ever experienced flooding? If yes, what was it like? How did you feel? What did you and your family do during and after the flooding? Can flooding happen where you live? What do you think causes flooding?
Factsheet!	Talk about what it means to move themselves and their things to higher ground. Have kids sit on the floor next to their chairs. Tell them to imagine there is a flood and water starts to cover the floor. What do think they should do? Now, have them get up and sit in their chairs. Will the water at the same level reach them now? Explain that moving upstairs in a house or apartment building is the safe thing to do when there is a flash flood.
Rain to Flood	Get a short bucket (6 to 8 inches tall). You can place items in the bottom, if you'd like, such as rocks that will sink and small toy cars or boats that will float. Tell students to imagine that there is a small town inside the bucket as if you're looking at a 3D map. Fill a small watering can with water. Demonstrate slowly pouring water into the bucket. Explain that if rain falls slowly like the water, it drains into the street drains or ground and goes away. But, when water has nowhere to go, or if the rain falls too quickly and too heavily, it floods. Pour the water quicker and heavier to show the effect.
Reflection	Wrap up your study of floods by having students write two facts in their *Ready Books* about flooding that they learned, and draw accompanying pictures.

4. Findings

4.1 Game preference and behaviour

Regarding game preferences and behaviour there some differences between the three groups of students. About hours spent playing the game, the majority of grades 1-2 and grades six students played the game less than 5 hours a week. In contrast, most of grades 3-5 student spent more than 5 hours a week. Regarding the game platform, between PC/mobile and Console game gave the same number in grades 1-3. The PC/mobile game was the most popular game platform among students of grades 3-5 (83%).

In contrast, there was no student play PC/mobile in grade 6. Concerning the type of the play the game, whether to play in single mode or multiplayer mode, most of the students of grades 1-3 played the game in multiplayer mode. While all of the students of grade 6 play game in multiplayer mode. Regarding the favourite game played by the students, 50% love to play Minecraft, and about 35% play sports game especially soccer game, and the others were chosed playing various games, such as pinball, marble game, etc.

Table 2

Gaming behaviour and preference

	Grades 1-2		Grades 3-5		Grades 6	
Hours spent for playing the game a day	Less than 5 hours	More than 5 hours	Less than 5 hours	More than 5 hours	Less than 5 hours	More than 5 hours
	3	1	1	5	2	0
The most platform of the played game	Console	PC/Mobile	Console	PC/Mobile	Console	PC/Mobile
	2	2	1	5	2	0
Single vs multi player game	Single	Multi	Single	Multi	Single	Multi
	0	4	3	3	0	2

4.2 Students feeling of learning disaster through printed material

- Grades 1-2

Regarding the students experience learning disaster, three students argued that they enjoy learning disaster awareness through storytelling. They opined that because of their ability to read and write, they could not understand very well about the material compared to others grade. The example of student opinion can be read as follow.

> "I just attended school for two months. So, I have not been able to read and write very well. By listening to the storytelling from the instructor, then I can understand what the purpose of this program is."

- Grades 3-5

The group of grades 3-5 was the majority of participants. The opinion from this groups was a primary concern of the experiment. Hence, we can make a general assumption of the findings. This group were able to write and read the material very well. This group also enjoy listening to the story from the instructor. Hence, this group can adjust their interest whether to study the material by listening to the storytelling or read the content directly. We picked up one of the opinions of the students as follow.

> "Learning from material by reading it directly was interesting because I can see the actual story. I can also respond to the question by writing my opinion by myself."

- Grade 6

Both of students argued that they more enjoy to read the material and understand the purpose of the material by himself. However, if they faced a problem, they can ask the instructor to explain the clearer description.

> "I prefered to read the content of material by myself, because by reading directly I could undertand more deeply and anlyzed it line by line of written material."

4.3 Students' opinion of playing the online game versus mobile for disaster education.

Regarding the student opinion of playing the game for disaster education, all students argued that playing the mobile game was more enjoyable and exciting. However, they opined that even tough playing such game were favourable, honestly, they did not understand what kind of the disaster and response. However, if the content of FEMA can be adopted into the mobile game, they argued that they would play more to understand the disaster that will be occurred in their surroundings.

5. Discussion

This study aims to collect student gaming behavior, preferences and their perspective on the use of the educational game for learning disaster awareness gave the evidence as follows.

Regarding to different learning intention of three groups of students, there some consideration. To satisfy the group grades 1-2 interest, a game intended for delivering the content of disaster awareness for this group should have an audio story telling feature. For example, most the game instruction should be in voice. In contrast, for the group of grades 6, the game should adopt the feature which encourage student to read more material, for example, visual novel, or role-playing game genre. However, the group of grades 3-5 tends to more flexible to use any game type for learning. Hence, by combining more than two genre of the game might be satisfy all need of the groups.

Regarding the game preference and behavior, students of grade 1-2 opine that their parent allowed them to fulfill the after school free time only one hour a day on the weekdays and 2-3 hours on the weekend. By limiting the behavior of playing the game at the after school free time, the parent of the students could control them to concern the school subject. Consequently, they could only play the game if they completed to re-study the school subjects. It is also related to the evidence obtained for the student of grade 6. They play the game only 30 minutes to one hour a day during weekdays and play for about 2 hours on the weekend. In Indonesia, the students of grade 6 should concern to their necessary task for preparing the national examination before they go to the junior high school.

In contrast, the majority of students of grade 3-5 claim that because their parent gifts them a good smartphone, hence they can play any mobile game without worry of the game quality. We assume if the parents ignore such behavior for a long period, it will give a negative effect for the students. Hence, parent, teacher and stakeholder including community leader and the government should provide an alternative way to encourage students to involved in positive activities. Regarding to the student perspective of using online and mobile game for disaster education, the majority of students agreed that they enjoy playing the mobile game even though the content is not fully understood. However, the way to deliver the content of disaster preparedness can be adopted. They have a hope that they can play a mobile game adopted the FEMA curriculum of disaster preparedness,

Nevertheless, smartphone has a considerable potency for developing the students' behavior. Concerning to disaster preparedness, the ownership of smartphone among students gave enormous strength to switch a lousy behavior using smartphone overtime for just entertainment gaming to useful gaming for learning.

6. Conclusion and Future Work

The qualitative experiment to measure students' perspective to the use of a smartphone for education game disaster awareness provided the necessary results. Students argued that using the mobile game; they can learn the disaster awareness more enjoyable. Based on the evidence of the qualitative experiment, hence, we would continue this work by design and develop the new approach of learning disaster awareness through mobile game. The game is intended to support elementary student how to prevent the flooding disaster by encouraging them to do some steps of waste

management such as no littering, sorting the garbage and picking up the trash. The game for kid awareness to flooding—KAFLOO—will adopt the location-based augmented reality game combined with some game genre with the hope that student will enjoy playing the game in the real environment. With the future study to develop KAFLOO, we hope it will provide an alternative of the educational program of disaster awareness that could be adopted by the government of Bandung city.

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