

# Disaster Risk Reduction for Students through Development of Educational Game Lusiana

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## ABSTRACT

The education sector has an important role in dealing with various challenges caused by disasters and preventing disaster hazards. Schools are institutions where knowledge and skills are shared; therefore, expectations for schools as role models for disaster prevention are high. The purpose of the study was to develop learning media in the form of educational game which concerns on disaster preparedness. The method used in the development of educational games is referred to Borg and Gall's development model. The development of the learning media is in form of an educational game called LUSIANA (Ludo-SiagaBencana). Data collection were carried out by doing observations, conducting interviews, and distributing questionnaires. Research respondents consisted of material experts, learning media experts, social studies teachers, and students. Data analysis used descriptive statistical analysis with percentages. The results showed that the LUSIANA educational game is very feasible to be used by the students.

**Key words:** *Disaster risk, Educational game, Development model*

## Introduction

Natural disasters are one of the natural phenomena that threaten human survival. Disasters can occur anytime, anywhere, and to anyone. The negative impacts can be in the form of material and non-material losses. Based on the disaster statistics from the Indonesian Disaster Information Data (DIBI) from January to September 2020, there have been 2,178 natural disasters with 628,568 people affected in Indonesia (Kemenpppa, 2020). Badan Nasional Penanggulangan Bencana (BNPB) –the natural disasters management agency–noted that there were 197 disasters occurred throughout Indonesia from 1 to 23 January 2021 (News, 2021). The majority of these disasters are hydro meteorological disasters–disasters that occur as a result of meteorological or natural phenomena. Floods dominated by causing 134 incidents, followed by landslides with 31 inci-

dents, and tornadoes with 24 incidents. Children are considered as one of the most vulnerable group of being affected by disasters. Children constitute the largest segment of the population of developing countries and are often the first victims of disasters. They are often the biggest victims in every disaster because of their inability to protect themselves and are beyond the control of their parents (Siregar and Wibowo, 2019).

For children, the impact of disasters is seen as more worrying hence, in Law Number 24 of 2007 concerning Disaster Management, children are grouped in the vulnerable category (Pahleviannur, 2019). Children's vulnerability to disasters is triggered by the limited understanding of the risks around them, which results in the lack of preparedness in dealing with disasters. This shows the importance of knowledge about disasters and disaster risk reduction from an early age to provide under-

standing and direction on the steps that must be taken when a threat occurs in the vicinity to reduce disaster risk.

One of the efforts to reduce disaster risk in Indonesia is through education. Education is a key that enables children to participate in disaster risk reduction. Disaster preparedness education must be integrated into development programs including the education sector (Pahleviannur, 2019). In addition, it was emphasized that education is one of the determining factors in disaster risk reduction activities. This is in line with the agreement set out by the Hyogo Framework for Action in 2005, that disaster risk reduction priorities need to be implemented in the education sector (Seo *et al.*, 2021).

Schools are institutions where knowledge and skills are shared, which makes the expectation from society that schools become role models in disaster prevention is high. The success of disaster mitigation is one of the main benchmarks of the success of education provided from generation to generation (Indriasari and Kusuma, 2020). Therefore, from an early age, disaster preparedness must be taught so that Indonesian society will be more aware and resilient in dealing with natural disasters.

Education related to disaster preparedness in schools requires appropriate methods and media to be well received by students. One way to facilitate the younger generation in learning education about disaster is through interactive learning media (Indartiwi *et al.*, 2020). The existence of learning media makes the process of delivering information more accurate and fun (Sahronih *et al.*, 2019). The use of appropriate learning media regarding disaster education is very necessary, in order to support the material presented to be effective and efficient in creating a disaster-resilient generation in Indonesia (Utami, 2020).

Based on the initial observations through interviews with teachers and students, it was concluded that students had minimal understanding of disaster preparedness. One of the factors that causes the low understanding of disaster preparedness is due to the lack of use of learning media. The available learning media is still conventional and lack of attractive illustrations.

Educational games are chosen as learning media about disasters because playing games are closely related to children's world. The concepts and procedures of disaster risk reduction education involve motivation of the students and create meaningful

learning in students so that learning can last long in their long-term memory. This research aims to develop an educational game based on disaster preparedness which is inspired by the Ludo World Games.

## Materials and Methods

This research was conducted at SMPN 1 Astambul, Banjar Regency, South Kalimantan, Indonesia. The reason for choosing that site is because natural disasters often occur in that area. BPBD South Kalimantan noted that there were 256,516 people affected by flood disasters spreading across 11 districts/cities (Jawapost, 2021). Banjar Regency was the worst affected area with a total of 17,996 families and 72,994 people.

This design of this research is research and development. The development model used in this research was adapted from Borg and Gall's development model. This development research contains 4 main components, namely (1) planning, preliminary study and information collecting, (2) developing preliminary form of product, (3) validations, and (4) field testing. Data collection was conducted by doing field observations, conducting interviews, and distributing questionnaires in the form of checklist ("). Questionnaires were used to assess the product development results which were shown to one material expert, one media expert, and two social studies teachers. Meanwhile, ten students were asked to give responses to the product being developed. This study used descriptive statistical data analysis techniques. The non-test instrument was in the form of a questionnaire using Likert scale. Likert scale category are: very good (5), above average (4), average (3), below average (2), and very poor (1). The percentage of the score is determined by using percentage formula (Sugiyono, 2017).

$$P = \frac{f}{N} \times 100\%$$

Notes:

P = percentage number

f = frequency

N = total of frequency / maximum score

Meanwhile, to find out the mean, the formula is as follow:

$$M = \frac{\sum fx}{N}$$

Notes:

M = mean

f = number of score.

N = total of score.

From the results of the assessment using a Likert scale, the mean from total of the sample was then investigated. Furthermore, it was converted to an assessment statement to determine the quality and level of usefulness of the product based on user opinions. The Likert scale table determines the percentage of the results of the assessment whether or not the product is feasible to be used as a learning media. The feasibility scale is: not feasible (0-20%), less feasible (21%-40%), quite feasible (41%-60%), feasible (61%-80%), very feasible (81%-100%).

## Results and Discussion

The stages of planning, preliminary study and initial information were conducted before developing learning media. The results of the initial data collection which show the high incidence of disasters in Banjar Regency, especially floods, becomes a reason to meet the needs of planning in dealing with natural disasters for children. Hence, a systematic and continuous effort is needed in disaster risk reduction. One of the ways to share knowledge about flood disaster preparedness is through the provision of facilities in the form of media that can be used by teachers easily to teach flood disaster preparedness to students in schools. At this stage, a draft of the educational game LUSIANA was carried out.

This product design was made by researchers in the form of a disaster alert-based-educational game which referred from data obtained from the field. The media is made based on the conditions of flood, landslide, tornado and land fire disaster area that often occur in Banjar Regency, South Kalimantan, Indonesia.

The media was initially compiled and depicted using the Adobe Photoshop application by inserting/adding pictures that represent each disaster event. The next stage was to prepare LUSIANA game's rules, question cards and answer cards according to the events of natural disasters that occurred in Banjar Regency. Whereas, the pawns are the participants themselves that aim to create an interactive game.

The researchers were assisted by IT experts to design the overall appearance of the media, so that it becomes an interesting media to use. LUSIANA is

an educational game that acts as a learning media to improve students' preparedness for natural disasters. The tools and materials needed in this game are as follows:

1. The media of the game is made of German flexy because the material has high resistance for outdoor and indoor use. The number of posts in this game is 20 boxes (divided into 4 sections representing natural disasters: floods, landslides, tornadoes and land fires) in which for each disaster section there are 5 posts. Overall, the size of the media is 4 x 4 meters. This game media is equipped with pictures that represent disaster events.
2. The dice is made of flannel filled with dacron. This dice is in the form of a cube with a diameter of 40 cm.
3. Question cards and answer cards about pre-disaster, during disaster, and post-disaster are provided in addition to the question card, an answer card is also provided.
4. Player. LUSIANA game requires a minimum of 8 people where each disaster incident consists of 2 people. One person acts as a pawn, and the other person reads the question card. Here is the final design of the educational game LUSIANA

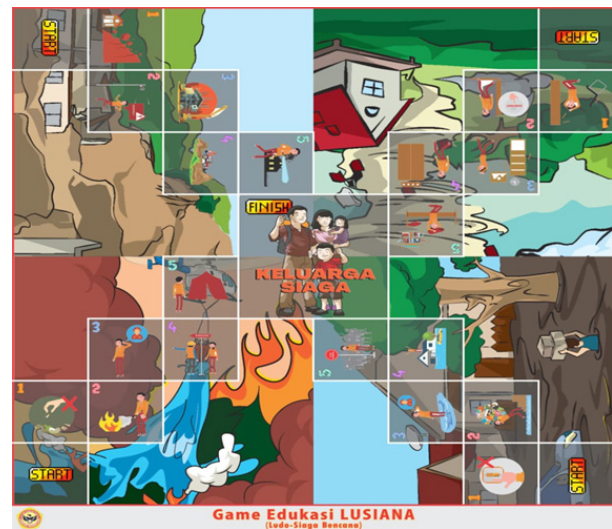


Fig. 1. Educational game of LUSIANA

Validity can be defined as accuracy, truth, or legality (Sugiyono, 2017). In development research, the validity test is intended to test the extent of the feasibility and quality of the developed media. After the product has been developed, the next step that

the researcher did was to test the feasibility of the educational game LUSIANA by doing validation. This validation was carried out by material experts and learning media experts. The purpose of this validation is to get feedback regarding the feasibility of the game material and the appearance of the learning media before being tested on students. The results from the validation of learning material experts and learning media experts can be seen in Figure 2.

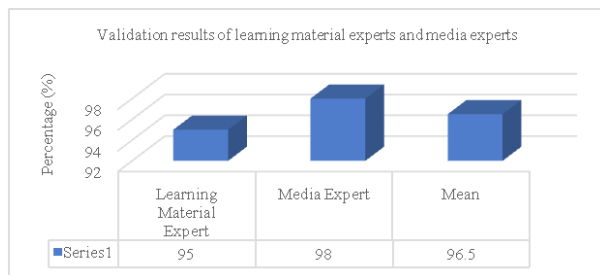


Fig. 2. Diagram of learning material experts and learning media expert validation

Based on Figure 2, the total score of the material expert's assessment was 95% and the total score of the learning media expert was 98%. There was a little note given by the material expert that in making questions, it is expected to use clear and short sentences. From the assessment of the two experts, an average score of 96.5% was obtained. This shows that the accuracy of the material and appearance of educational games is categorized in the "very feasible" category to be tested/used for students.

Besides being validated by learning material experts and learning media experts, this educational game was also validated by teachers. Validation on teachers was done to ensure the data and to find out the broad appeal of the product. Respondents for this validation were addressed to 2 social studies

teachers at SMPN 1 Astambul, Banjar Regency (where the trial was carried out). The data from the social studies teacher validation can be seen in Figure 3.

Based on Figure 3, the total score obtained from Teacher 1 was 100% and the total score from Teacher 2 was 87.6%. A note was given by the Teacher 2 that there should be folk song to be played when game is played by students. From the assessment of the two social studies teachers, an average score of 93.8% was obtained. This shows the accuracy of the material and appearance of the educational game LUSIANA is categorized in the "very feasible" category to be tested/used for students.

After being validated by social studies teachers, LUSIANA educational game was then tested on 10 respondents. The respondents were students of SMPN 1 Astambul, Banjar Regency. Students were asked to fill out a questionnaire after trying to play the educational game LUSIANA. Data from students' responses can be seen in Figure 4.

Education about disaster preparedness is vital for all Indonesian society, especially for young learners, since Indonesia is one of the countries in which natural disasters often occur according to the United International Strategy for Disaster Reduction. Various natural disasters such as earthquakes, tsunamis, volcanic eruptions, floods, landslides, droughts, and forest fires are often to occur in Indonesia. Learning from experiences about the impact and hazards of the natural disasters that exist in Indonesia, it is necessary to teach Indonesian people about disaster preparedness. It can be initiated by providing education about disaster preparedness in schools about how to save themselves when disasters occur and how to avoid accident.

The findings of the research show that students are very enthusiastic and enjoy playing the LUSIANA game, besides that they also have knowl-

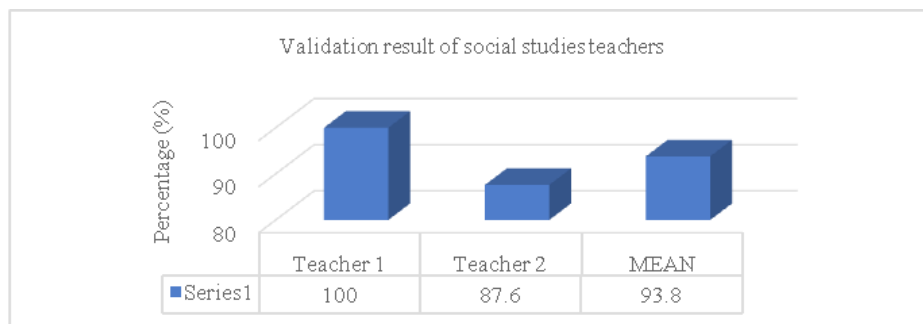


Fig. 3. Diagram of validation from social studies teachers



edge about disaster mitigation through this game. In line with research findings by (Singh *et al.*, 2021) that students enjoy playing games and there is an increase in their skill development. According to Piaget and Vygotsky, children do not necessarily master knowledge because of the maturity factor, but rather because of an active interaction with their environment (Colliver and Veraksa, 2021).

Developing educational games is an interesting activity. There are several advantages of using educational games compared to conventional educational methods. One significant advantage is the presence of images that can improve children's memory so that they can comprehend the lesson for a longer time compared to learning from conventional teaching methods (Turan *et al.*, 2020). In addition, educational games can also visualize real problems that occur.

The awareness of being prepared for the natural disaster event needs to be possessed by every student who lives in an area that is prone to disasters (Marlyono and Urfan, 2020). Education about disaster from an early age needs to be encouraged as a lesson and introduction to disaster mitigation (Delima *et al.*, 2021). Game-based learning is one of the most interesting educational methods, and it has the potential and promise to be applied in disaster prevention education (Tsai *et al.*, 2020).

Educational games are special games designed to teach users a certain lesson, develop concepts and understanding and guide them in practicing their skills, and motivate them to play it. One of the advantages of educational games is the use of animation that can improve memory so that they can comprehend the lesson for a longer time compared to learning from conventional teaching methods. Game-based learning is able to provide stimulate

learning for participants.

Based on the results of the expert's validation, teachers and students' responses to the educational game LUSIANA show that this game is very feasible to use. It is because LUSIANA includes three important aspects; visual (interactive images), audio (discussions and questions and answers), and affective aspects (disaster preparedness). Through educational games, LUSIANA is expected to encourage students' awareness and understanding of the importance of disaster preparedness since natural disasters can occur anywhere and anytime. LUSIANA can be used to train students' preparedness in an emergency condition so that they can minimize the impacts caused by disasters. As a result, people from children to adults know and understand how to carry out rescue procedures to reduce the impacts and victims.

The purpose of LUSIANA educational game is to help children to protect themselves to face natural disasters such as floods, landslides, tornadoes, land fires, and other natural disasters. This educational game not only provide children with information but is also useful as a tutorial for children as a direct practice on things to do during a disaster or after a disaster. LUSIANA is not only fun to play for children, but also is an interesting learning media with the theme of disaster preparedness for natural disasters. One of the major benefits of disaster preparedness based educational game is upgrading knowledge related to disaster mitigation and improving communication between players because in this game, children will be taught how to communicate and how to give empathy with peers (Putri and Suparti, 2020). For young learners, LUSIANA can train children to solve problems, construct strategies, and think creatively and critically.

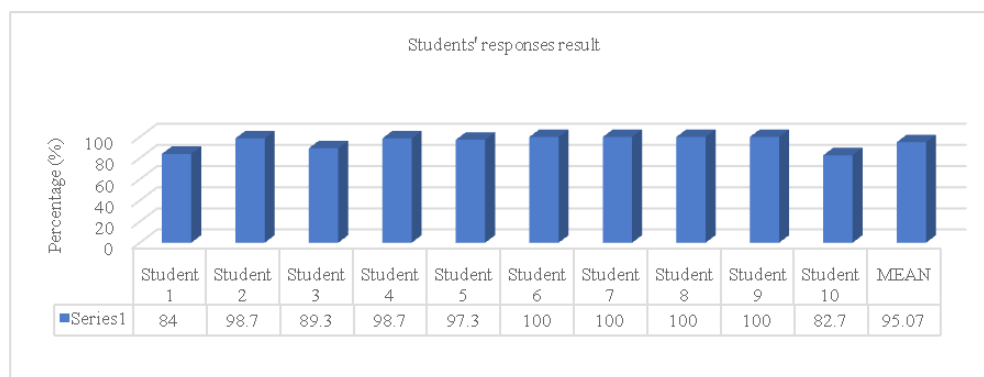


Fig 4. The result of SMPN 1 Astambul student's responses

Based on the previous studies, humans do not easily forget what they have learned at an early age (Hidayat *et al.*, 2020). Therefore, it is important for the community to learn disaster risk prevention from childhood through education in schools (Wongphyat and Tanaka, 2020). By learning through fun games, it is expected that cognitive and behavioral outcomes will be improved.

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## Conclusion

Reducing disaster risk in schools is essential considering that Indonesia is a disaster-prone country. To create this preparedness, students need to play an active role in disaster preparedness efforts at the school level. One of the methods is through educational games based on disaster preparedness. Based on the results obtained from expert validation and field try-out to teachers and student, it can be concluded that LUSIANA educational game is categorized in the "very feasible" category for students to use in schools. It is very useful to introduce LUSIANA to student, so they can prepare and protect themselves when facing an earthquake disaster. In the future, more interactive and accessible educational games need to be developed so that they can be accessed via smartphones.

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