Transmedia Learning Map: Disaster Risk Reduction Education Content for Primary School Students in Indonesia

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Abstract. This paper studies earthquake disaster risk reduction education for primary school students in Indonesia. The research was employed mainly by the concept of transmedia learning proposed by Jenkins (2009) from the perspective of the teaching-learning process. This is because previous research revealed a few limitations, such as conventional learning methods, usability concerns and technological constraints, implying that for optimal efficiency, DRR education content should ideally include more diverse media (analog and digital). Transmedia learning enables the development of innovative user-centric educational practices, and the implementation of collaborative strategies that ultimately meet user needs. Transmedia learning approach can be an opportunity to create new learning scenarios that can help facilitate the process of understanding and educating disaster risk reduction to multi-informant ranging from primary school students, parents, local government workers, and disaster experts. This transmedia learning approach covered the whole process from planning, strategy, content making and execution for education materials. This research has led the author to the conclusion that children should be taught DRR in a fun and engaging manner to maintain their interest and ensure they completely comprehend the concepts. The findings and insights can be applied not only to future research, but also to the development of educational materials for reducing earthquake disaster risk.

Keywords: Transmedia storytelling, Children, Disaster Risk Reduction.

1 Introduction

The Indonesian archipelago is one of the countries with a high risk of disaster due to its geological and geographical location. Indonesia is geologically placed at the meeting point of four active tectonic plates in the world: the Australian plate, the Eurasian plate, the Pacific plate, and one Philippine microplate. As a result, Indonesia is vulnerable to earthquakes, and several significant earthquakes have resulted in tsunamis. This is also due to the fact that Indonesia is traversed by the fire belt or ring of fire [1]. According to the 2020 Indonesia Disaster Risk Index book, out of 34 provinces in Indonesia, only 13 provinces have a medium disaster risk index, while the rest are in the index with

high disaster risk [2]. One of those affected and vulnerable to disasters is children. Children are regarded as one of the most vulnerable populations in the event of a disaster. According to WHO (2011), children account for 30-50% of fatalities caused by natural disasters. Children are more likely to be harmed, have less access to crucial humanitarian aid such as food and health treatment, and are subject to additional dangers such as separation from their relatives or caretakers [3].

Indonesia is one of 168 nations that have ratified the Hyogo Framework for Action (HFA), which is dedicated to preventing the loss of human, social, economic, and environmental assets as a result of disasters. Due to the government's limitations in disaster mitigation, one alternative is to provide information to the larger population, particularly schoolchildren, as a preventive strategy to deal with disasters. One of HFA's priorities is to employ knowledge, innovation, and education to foster a culture of safety at all levels/ disaster preparedness at all educational levels [4]. This is the reason why education is a critical tool for children to participate in disaster risk reduction (DRR) [5]. Therefore, it should have the ability to know the vulnerabilities that exist so that it can be the main subject in disaster risk reduction efforts and minimise losses that arise. This can only happen if the community has a plan to reduce disaster risk and has knowledge and understanding of what should be done when the disaster has not occurred (pre-disaster), during emergency response, and in the post-disaster. The importance of increasing understanding and resilience to disasters must be instilled in the surrounding community about what things they should do when unexpected disaster events occur [6].

One way to convey messages and education is transmedia learning, where this research aims to involve transmedia using various media to tell stories to DRR education for children. The legacy of storytelling included in this broad definition is enormous, leading experts to use many tools in cross-media storytelling to study different phenomena [7]. Pratten stated that transmedia storytelling is the process of storytelling through various platforms, where in its presentation the audience participates in order to achieve a comprehensive experience [8]. Users' full involvement and attention are essential while delivering educational content. Storytelling is used to gather insights, establish empathy, and connect emotionally with the user participating in the story [9].

This is different from conventional learning methods where the learning method only focusing on one-way, transient knowledge or skill transmission is insufficient [10]. Creating and maintaining a community of practice can be more beneficial in the long run. Participants in the community of practice include both those who teach "provisionally" and those who learn "provisionally" [11].

The challenge to make this happen is when each media can still be enjoyed singularly, although the culmination of the experience will be when all media have been accessed and understood. One effective way to address media convergence and narrative dissemination is to treat the storyworld as a narrative ecosystem. It can account for all aspects involved in cross-media narrative production without removing specificity from each product that configures the ecosystem. Narrative ecosystems view narratives as complex networks regulated by the concepts of modularity, interoperability, scalability, and adaptability [12]. The idea of a narrative ecosystem makes the connection between the various narrative blocks and the many media involved important, which

makes the transmedia story world more holistic. Transmedia learning can be an opportunity to create new learning scenarios that enable the development of innovative user-centred educational practices, and the implementation of collaborative strategies that ultimately meet user needs. This study intends to gather and analyse data for the purpose of developing a transmedia learning map to aid in the learning process and knowledge of earthquake disaster risk reduction (DRR) for children.

2   Methodology

A multi-informant, mixed methods strategy was used in this study, which focused on primary school workers, parents, and students. To begin, a questionnaire was provided to parents of primary school-aged children to assess their awareness about DRR education and children's role in it. Second, interviews were conducted with DRR specialists such as BNPB (government) and Predikt (NGO) to investigate scaling up and implementation problems, as both organisations have campaigned for national DRR education implementation. Third, elementary school students took part in the study by completing a questionnaire designed to assess their knowledge and opinions on disaster risk reduction as well as their media behaviour. Fourth, focus group discussions with primary school teachers were held to assess the problems of implementing DRR education. The last phase is examining the phenomena that occur in the community related to the earthquake disaster. At this stage, the author uses literature studies from various books, journals, websites, documentaries, and articles to gain a general understanding of disaster mitigation and study the development of earthquake disaster mitigation research. All this component of the methodology was undertaken to study DRR education, to assess the audience's understanding of DRR education for children, and also to get to know their media behaviour that would be useful when creating a transmedia map.

Mixed methods strategy used because it can provide users with a 'rich description' of the participants' settings, making their actions, experiences, perceptions, and feelings more relevant. Furthermore, it lets users examine whether and how the findings of this study may be used in their own circumstances [13]. The study was carried out between July 2022 and November 2022.

3   Data Gathering

Based on mixed methods above, the author obtained data that educational materials on earthquake mitigation have not been delivered optimally due to the lack of coherent, complete, and active learning material sources that can be practised directly. It can be known through interviews that the delivery of material about earthquakes is only delivered through counselling for a short period of time and material about the causes of earthquakes contained in printed primary school books. In addition, from the existing study that the author conducted, there has not been found a learning media about earthquake preparedness that contains a coherent and complete explanation so that it is difficult to practise directly by children.

According to Tasril Mulyadi (BNPB/government agencies), Avianto Amri (Predikt/DDR practitioner), and Adhitya Arinugroho (educator), disaster education media for children must incorporate fun elements and interesting interactions so that children

can become advocates for their families. Furthermore, it is well known that the obligation of children to do schoolwork motivates them to learn about disaster preparedness so that their assignments receive higher grades. Furthermore, questionnaires were conducted on 100 parents aged 30-45 years through the Jakpat Survey Report and on primary school students in Tangerang, as many as 99 children with an age range of 9–12 years and grades 3-6.

In this questionnaire, there are five question parts, namely verification, perception, medium and content, pain, and preference, which are summarized into ten questions. In the verification question, the author asked the respondents' experiences in teaching their children to prepare for earthquakes. From this question, it was found that 97% of parents already have a high awareness of the need to teach preparedness for facing earthquakes to their children. However, the questionnaires of students did not reflect the aligned results: 98 and 81 votes answered incorrectly to two questions about how to prepare for an earthquake, respectively.

First, the question of what to do when an earthquake occurs in this question, 99% of parents answered the wrong answer, namely, directly leaving the room and looking for a safe field. The second question is parents' knowledge about the media where their children get information, and the answer is the top percentage: children get information and entertainment through Youtube media as much as 94%, television as much as 61%, and Tiktok as much as 29%. But from the data collected when visiting schools, it turns out that Tiktok (90%) is the main medium for children to find information and entertainment.

Another insight from the data that has been obtained in the mixed-methods approach is that children need media that is interactive and can be practised directly; The lack of a detailed and in-depth material foundation regarding earthquake disaster preparedness so that it cannot be applied optimally in real life; Although interactive and fun media resources are available for children, these features have not been accompanied by complete material that suits the needs of the target audience; Earthquake preparedness education materials are often intensively delivered only after the earthquake has occurred; Teachers still use printed books as the main source of learning media in schools; Children are prospective agents of change in the context of delivering earthquake disaster preparedness information. Therefore, to improve the effectiveness of the dissemination of earthquake preparedness education media, the data obtained from qualitative and quantitative methods will be analysed and interpreted in the form of a transmedia learning design.

4   Transmedia Learning Map Process

There are several things that need to be prepared before creating a transmedia learning map in earthquake DRR education. In this study, we employ a design strategy focused on issue resolution, namely the transmedia learning technique, the product of which is a transmedia bible and transmedia mapping. This design process incorporates six components: audience, narrative, platform, experience, business models, and execution [14]. One of them is to prepare data that has been analysed as insight to determine the right content strategy and platform. Based on the insight in the previous chapter, the team of authors offers solutions based on the transmedia learning methods, which can

serve as a strategic link between formal and informal education. Transmedia learning can be defined as the use of storytelling techniques in conjunction with the usage of numerous platforms to create an immersive learning landscape with multiple entry and exit points for learning and teaching. The unifying idea of the learning environment is critical because it can become a landscape for learning with few, if any, limits [15]. Transmedia learning also has a variety of content delivery in various media and most importantly forms a participatory culture where the audience is an agent of change and participates in shaping and filling content [16]. In other words, transmedia learning provides a new way of learning.

Table 1. Earthquake disaster mitigation flow.

DISASTER RISK MITIGATION		
PRE-EARTHQUAKE	**EARTHQUAKE**	**POST-EARTHQUAKE**
Recognizing disaster-prone locations around the house: marked paths, assembly points, disaster simulations.	Receive information and guidance from BMKG, BNP, and emergency officers	Reporting of damage and injuries
Earthquake application from BMKG	Take disaster response actions according to standards determined by BPNB	Treatment, Refuge
		Establishment of a relief command
Emergency telephone numbers	Evacuation	Evacuation
Earthquake Emergency Bag	Earthquake Emergency Bag	
Earthquake resistant buildings and furniture	Earthquake resistant buildings and furniture	Earthquake resistant buildings and furniture

The first stage is to identify and analyse the target audience for earthquake DRR education. The primary target audience is Indonesian primary school students grades 3-6 and ages 9 to 12. Children between the ages of 9 and 12 were chosen because they can think in complex manners and are more active in communal life [17]. As a result, children of this age can contribute to the safety of themselves, their families, and those around them [18]. This is also consistent with insights from interviews, specifically about youngsters who are expected to become change agents, opening up new pathways for imparting earthquake DRR education.

Table 2. Earthquake disaster mitigation audience analysis.

Category	Primary School 4th-6th grade	Teacher	Parents	Government
Age	9-12	27-40	30-40	26-40
Gender	Unisex	Unisex	Unisex	Unisex
Social Class	B-C	B	B-C	B-AB
Income	B-C	B-C	B-C	B-C
Types of Neighbourhoods	Moderate, modest	Moderate	Moderate	Moderate
Residence	Urban	Urban	Urban	General

Based on prior data, it was also determined that collaboration among the government, teachers, children, and parents is required in the process of supplying earthquake preparedness information. As a result, DRR education content is designed not just for the primary target, namely students in grades 3-6, but also for other stakeholders (parents, teachers, and government). The user journey for sharing DRR educational content for students in grades 3-6 is outlined below:
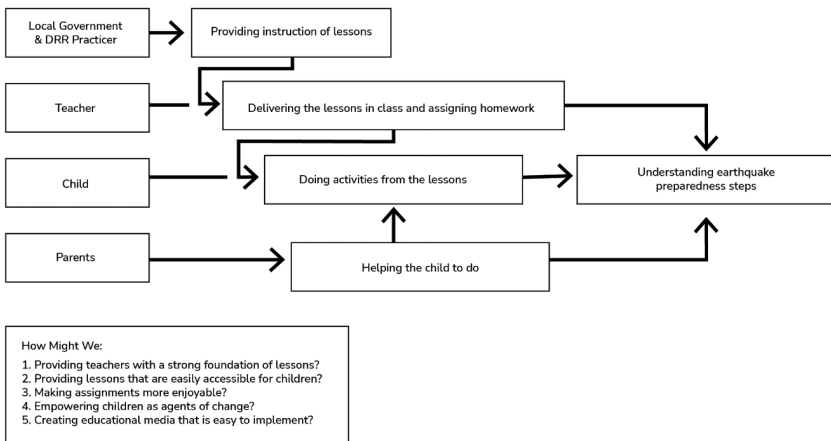

Fig. 1. User journey earthquake disaster risk reduction content

After mapping and analysing the audience, enter the next stage, which is to determine the right narrative/story. The writing team uses the concept of 'Sahabat Gempa' (earthquake friends). This is related to the geographical condition of Indonesia, which is called a disaster laboratorium, where earthquake disasters are common [19]. Therefore, we try to build a narrative that we must coexist with nature and all its situations.

'Sahabat Gempa' are also described as hopeful figures and can be close friends of children, so with the existence of this character it is hoped that they can learn earthquake preparedness steps in a fun way and can be applied throughout their lives. In transmedia, the character plays a role, whether he/she and other elements are focused on the micro-narrative that directly establishes the world of storytelling or he/she transforms into a transmedial character [20].

In compiling content and media strategies for transmedia learning to mitigate this earthquake disaster, the author team chose platforms or media that have high participation and immersivity values, this is done so that the audience is more 'entered' into the world of narratives that are built. It is expected that the higher the audience participation, the higher his experience and understanding of earthquake disaster mitigation. Earthquake DRR education will be more effective if it connects schools and families at home. Furthermore, standardisation and consistency of messages to be delivered in disaster risk reduction education materials are required [21]. Despite the fact that the stages of interaction, pacing, and timeframe for transmedia appear to be linear, the process of creating transmedia content can be quite dynamic and organic. Because of this, transmedia mapping is required to facilitate the process of transmedia learning.
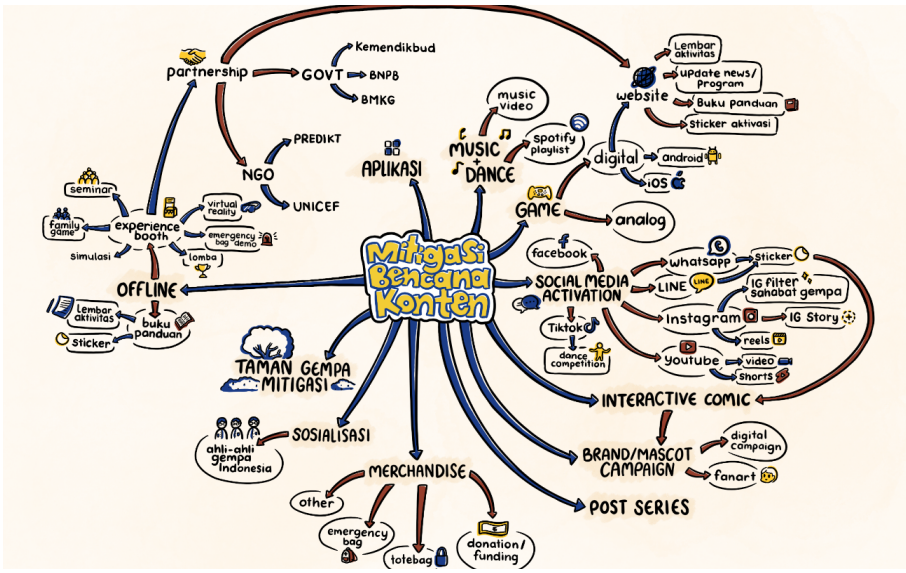

Fig. 2. User journey earthquake disaster risk reduction content

After designing a transmedia map for earthquake DRR education content, and based on the transmedia aspects previously described and assessed, the major assets that will serve as a communication bridge between the material and the audience are visualised at this stage. Some of the visual assets that were prepared for the transmedia learning content are visual identity, character design, a dummy website, and mobile apps.

Fig. 3. Transmedia mapping disaster risk reduction visual asset

5   Conclusion

Disaster risk reduction education is a key component in assisting youngsters in developing the skills and information required to remain safe in the case of a disaster. When teaching DRR to children aged 9 to 12, the following are some crucial variables to cover:

1. *Understanding Catastrophes*: Children should be educated about various forms of catastrophes such as earthquakes, floods, storms, and fires, among others. They should understand how disasters occur and what causes them.
2. *Risk Assessment*: Children should learn how to recognize the risks connected with their environment, including the likelihood and severity of potential dangers.
3. *Emergency Preparedness*: Children should understand how to prepare for emergencies, such as drafting emergency plans, assembling emergency supplies, and recognizing safe areas in their homes or communities.
4. *Response and Recovery*: Children should learn what to do during and after a disaster, such as where to seek shelter, how to communicate with family members, and how to help with recovery efforts.
5. *Teamwork and Cooperation*: Children should understand the value of working together with others during emergencies, including following emergency responder orders and assisting others in need.
6. *Communication*: Children should learn how to communicate efficiently during emergencies, including how to use emergency phone numbers and radio channels, as well as how to use social media platforms.

7. *Hazard Awareness*: Children should be taught about potential hazards in their environment, such as electrical appliances, water sources, and fire exits.
8. *Emotional Resilience*: children should be taught how to deal with the emotional aftermath of a disaster, such as anxiety, stress, and trauma.
9. *Environmental Sustainability*: Children should learn how to contribute to environmental sustainability through preserving nature and reducing pollution in order to lessen the recurrence of natural disasters.

It is critical to teach DRR to children in a pleasant and engaging manner in order to maintain their interest and guarantee that they understand the principles being taught. For young audiences, involvement in a topic is critical; children can benefit from role-playing, interactive games, storytelling, an interactive learning experience through participation in a game, sections in a book, reading comics, and other activities to make learning more exciting and remembered, which can help them understand critical subjects [22]. To support and carry out the steps above, we can disseminate content and education about earthquake disaster mitigation with the transmedia learning method. This method makes it possible to deliver content in parallel to many types and types of audiences in parallel. Transmedia also moves with various media variations and uniqueness, which will open many channels and entry points that make audiences more motivated to participate and provide feedback for the content provided. Increasing audience understanding and participation in earthquake disaster mitigation in Indonesia can make them better prepared to face earthquake disasters and minimise losses associated with such disasters.

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