



Teachers' Perspectives on Interactive Digital Books for Early Childhood Earthquake Mitigation Education

Winda Sulistyowati*, Euis Kurniati, Risty Justicia
Universitas Pendidikan Indonesia, Bandung, Indonesia
*sulistwinda@upi.edu

Abstract

This research is motivated by the lack of disaster mitigation education due to teachers' difficulties in conveying abstract disaster-related concepts in early childhood education. However, earthquake disaster mitigation education is crucial for children. This study aims to explore teachers' perspectives on the concept and urgency of disaster mitigation education, analyze teachers' views on the potential of interactive digital books for disaster mitigation, and identify challenges faced during the implementation of interactive digital book media in earthquake disaster mitigation education. This research employs a qualitative method with a case study design. The research subjects were teachers from Elhafa Plus Kindergarten, and data were collected through in-depth interviews, observations, and documentation. The research findings indicate that teachers explicitly emphasize the importance of disaster mitigation education in kindergarten to foster disaster preparedness in children. The implementation of interactive digital books yielded satisfactory results, with teachers rating as high as 90% that this interactive digital book is highly suitable for use in earthquake mitigation education in kindergarten. Teachers selected the photo-together feature as the most attention-grabbing feature because children are engaged in role-playing as if an earthquake is occurring. The challenges faced by teachers in implementing interactive digital book media include the need for digital devices with large screens like Smart TVs so that all children can see clearly and the challenge of managing children's tremendous enthusiasm for using technology such as this interactive digital book media.

Keywords: Disaster Mitigation; Early Childhood Education; Earthquake; Digital Media; Interactive Digital Book

Abstrak

Penelitian ini dilatarbelakangi oleh minimnya edukasi mitigasi bencana yang disebabkan oleh kesulitan guru dalam menyampaikan konsep-konsep abstrak terkait bencana pada pendidikan anak usia dini. Pada kenyataannya, edukasi mitigasi bencana gempa bumi merupakan hal yang sangat penting bagi anak-anak. Penelitian ini bertujuan untuk mengeksplorasi perspektif guru terhadap konsep dan urgensi edukasi mitigasi bencana, menganalisis pandangan guru terhadap potensi buku digital interaktif untuk mitigasi bencana, serta mengidentifikasi tantangan yang dihadapi selama implementasi media buku digital interaktif dalam pendidikan mitigasi bencana gempa bumi. Penelitian ini menggunakan metode kualitatif dengan desain studi kasus. Subjek penelitian adalah seorang guru dari TK Elhafa Plus, dan teknik pengumpulan data dilakukan melalui wawancara mendalam, observasi, dan dokumentasi. Hasil penelitian menunjukkan bahwa guru secara eksplisit menekankan pentingnya edukasi mitigasi bencana di taman kanak-kanak untuk menumbuhkan kesiapsiagaan bencana pada anak-anak. Implementasi buku digital interaktif memperoleh hasil yang memuaskan, bahkan guru memberikan penilaian setinggi 90% bahwa buku digital interaktif ini sangat layak digunakan dalam edukasi mitigasi gempa bumi di taman kanak-kanak. Guru memilih fitur foto bersama

sebagai fitur yang paling menarik perhatian karena anak-anak diajak bermain peran seolah-olah sedang terjadi gempa bumi. Tantangan yang dihadapi guru dalam mengimplementasikan media buku digital interaktif adalah kebutuhan akan perangkat digital dengan layar yang besar agar dapat terlihat jelas oleh seluruh anak dan tantangan dalam mengelola antusiasme anak-anak yang sangat besar terhadap penggunaan teknologi seperti media buku digital interaktif ini.

Kata Kunci: Mitigasi Bencana; Pendidikan Anak Usia Dini; Gempa Bumi; Media Digital; Buku Digital Interaktif

Introduction

Indonesia is located in Pacific Ring of Fire region (Warsono and Buchari, 2019). Geologically, the Ring of Fire region is characterized by high seismic activity and volcanic eruptions. Based on Indonesian Law Number 24 of 2007 concerning Disaster Management, disasters are defined as events or series of events that can threaten and disrupt community life, cause environmental damage, property loss, and even casualties. According to data from the Badan Nasional Penanggulangan Bencana (BNPB), from January 1, 2025, to June 19, 2025, a total of 1,685 disasters have occurred in Indonesia. These disasters have caused damage to 20,000 environmental units and affected more than 4,000,000 people, with 261 fatalities (BNPB, 2025).



Picture 1. Indonesian Disaster Data and Information
(Source: BNPB, 2025)

The high number of disaster-related losses is caused by the lack of public understanding and awareness regarding disasters (Justicia et al., 2023). The psychological impact of disasters can be felt by all age groups, from elderly, adults, teenagers, to children, generally relating to health, social life, economic conditions, religious life, and psychological well-being (Anggarasari and Dewi, 2019). To reduce the impact of disasters, knowledge about disasters themselves is required (Sari et al., 2023). Knowledge about disasters can be acquired through disaster mitigation education or training.

In accordance with Indonesian Law Number 24 of 2007 concerning Disaster Management Article 44, mitigation is defined as a series of efforts to reduce disaster risk through physical development and community awareness. Natural disasters such as earthquakes have significant potential to cause major damage to property and lives (Li and Zhou, 2020). Furthermore, earthquakes cannot yet be predicted with sufficient accuracy to avoid damage from earthquake disasters (Chai and Wu, 2023). Earthquake disaster mitigation efforts require close collaboration between various stakeholders, including government, academia, and civil society (Putri et al., 2024).

Therefore, government agencies should enhance earthquake disaster mitigation education for local residents as part of national efforts to reduce the adverse effects of earthquakes in the future (Ao et al., 2021). Given the high potential for earthquake disasters in Indonesia, it is crucial to introduce awareness about the importance of disaster mitigation education from an early age, starting with introducing basic concepts about

disasters, protection methods, and evacuation procedures (Irawan et al., 2022). Building disaster awareness from an early age is a key element in creating resilient communities ready to face disasters. Through this approach, children will grow into a generation with knowledge, attitudes, and skills in facing disasters. Early disaster mitigation education will not only improve individual attitudes, knowledge, and safety but also foster a sustainable disaster preparedness culture in society (Lilianti et al., 2023).

Disaster mitigation education for early childhood is one of the most fundamental prevention strategies in reducing the risk of casualties and damage from disasters. Children are the most vulnerable group in emergency situations, yet they also have unique potential to absorb, process, and implement safety knowledge quickly, especially since early childhood is considered the golden age period when children are believed to absorb information rapidly (Nurani et al., 2022). In reality, disaster mitigation education from schools remains low (Wijaya and Isni, 2018).

With low educational input from schools, children's understanding of disasters becomes a frequently overlooked problem. This may occur because government guidelines on disaster mitigation are only known by educators without follow-up actions, as teachers feel difficulty integrating disaster mitigation education in early childhood education institutions (Oktaria et al., 2023). The current education system is still very limited in integrating disaster mitigation materials into the learning curriculum (Atmojo, 2020). However, education is believed to be one of the effective means in efforts to reduce disaster impacts by incorporating disaster mitigation learning materials into curricula at every educational institution (Aziz et al., 2022).

The role of teachers in the learning process, particularly at the early childhood education level, cannot be ignored. Early childhood teachers are the frontline in developing character and abilities during children's golden age (Wiguna, 2021). Therefore, in the context of earthquake disaster mitigation education, teachers have significant responsibility in translating abstract concepts of earthquake disasters into information that is easily understood and remembered by early childhood students. Teachers can utilize learning media as aids in earthquake disaster mitigation education to effectively convey information.

Learning media are tools that aim to facilitate enjoyable learning processes (Fransiska et al., 2024). Children need interactive and enjoyable approaches that can translate disaster mitigation concepts into forms that are easily understood and remembered (Ubaidillah et al., 2024). This is supported by the fact that children have relatively short attention spans, making them easily bored with less interesting material (Aziz et al., 2022). The development of innovative, interactive educational media adapted to children's psychological characteristics becomes one strategic solution. Learning media can combine educational elements, entertainment, and practical simulations that are expected to effectively improve children's understanding and skills in facing potential disasters (Khambali et al., 2021).

With learning media, teachers can be assisted in implementing classroom learning. The availability of learning media functioning as aids can help students absorb and understand the information provided (Sari et al., 2022). Several studies have used learning media as a bridge to provide disaster mitigation education to students in schools. The use of flashcards in disaster mitigation education has been shown to create an engaging and enjoyable learning environment for early childhood (Widanty and Pamungkas, 2023). Furthermore, illustrated storybooks are a concrete medium that provides children with more hands-on experiences, thus enhancing their understanding of disaster mitigation (Kartika, Ardhyantama and Tisngati, 2023; Marlina et al., 2021).

Furthermore, technology in learning media can also serve as a bridge in disaster mitigation education, namely through audiovisual learning media that can simultaneously display images and sounds, increasing children's sense of preparedness (Narayana et al., 2006). Rapid technological advancement should be utilized as a learning strategy (Kurniasih, 2019). The use of technology in schools can certainly help increase children's interest and engagement in learning because technology appears more attractive and entertaining (Haleem et al., 2022).

The utilization of technology in the form of digital learning media can help children absorb information that educators want to convey. Digital learning media can take the form of learning platforms containing online games, quizzes, and videos or images (Abdillah et al., 2022). Digital learning media can function as a place to explore and express children's imagination, especially when children use interactive digital media (Burke et al., 2023). Interactive digital media is media that has features where children can touch screens or move anything within it, meaning interactive digital media requires direct action from children (such as by voice or touch) to determine whether children respond correctly to content (Qaiser, 2020; Anderson and Subrahmanyam, 2017; Calvert, 2015).

Technological advancement offers various innovative media options, including interactive digital book media. Therefore, the utilization of interactive digital book media can be used to enhance children's knowledge about disaster mitigation. In the context of disaster mitigation, interactive digital books have the potential to present simple simulations or disaster scenarios in safe environments, allowing children to practice responses without facing real dangers. The development of digital book learning media will not only improve children's understanding of safety procedures but also foster disaster preparedness and awareness from an early age.

This is supported by research results stating that digital media has proven to develop knowledge and attitudes in early childhood to be responsive to disasters (Nurani et al., 2022). This aligns with research results proving that digital media can develop a proactive and responsive attitude towards disasters from an early age (Insany et al., 2024). Several research findings related to the development of earthquake disaster mitigation digital book media have obtained good results. Digital book media based on earthquake disaster mitigation greatly helps educators in delivering material about earthquakes.

This is supported by research results conducted Sayekti et al., (2024) which state that designed digital books can function well as educator resources in helping convey information about earthquake disasters, even when implemented with students. Other findings show that digital books can be used to reduce the impact caused by earthquake disasters because students have preparedness skills that are very necessary in facing earthquake disasters, proven to be valid and effective for use in school learning processes to prepare alert students (Ayu and Fauzi, 2021).

However, these studies focus on the effectiveness of learning media and have not specifically explored teachers' perceptions of the potential and challenges of interactive digital books in integrating earthquake disaster mitigation education. Therefore, the novelty of this research lies in its specific focus on exploring internal perspectives of teachers as key actors, deeply examining teachers' views on the importance of disaster mitigation education, particularly in earthquake disasters. Additionally, this research focuses on the potential of interactive digital book media based on earthquake disaster mitigation education (not merely general digital media) and also on challenges that teachers will face in implementing such media.

The gap in this research clearly proves that disaster mitigation education is important to introduce from an early age to reduce the risk of disaster casualties, but in reality, disaster mitigation education from schools remains low Wijaya and Isni (2018) because educators feel difficulty integrating disaster mitigation education in early childhood education institutions (Oktaria et al., 2023). Therefore, it is important to understand teachers' perspectives on implementing disaster mitigation education in schools to identify difficulties or challenges faced by teachers in implementing disaster mitigation education.

Based on the above introduction, several previous studies have focused more on developing disaster mitigation-based learning media or measuring their effectiveness on children, but few have explicitly explored teachers' perspectives as primary users and facilitators. However, understanding how teachers view and interact with these media innovations will provide new insights. Therefore, the purpose of this research is to explore teachers' perspectives on understanding concepts and urgency of earthquake disaster mitigation education for early childhood, perspectives on the potential of interactive digital book media in integrating earthquake disaster mitigation education, and challenges faced in implementing interactive digital book media for earthquake disaster mitigation education.

Method

The research method employed was qualitative research with a case study approach. The case study method was utilized because this research explores a specific case in depth. The researcher chose a qualitative approach with a case study design because the researcher aimed to investigate deeply and explore teachers' understanding of the importance of earthquake disaster mitigation education for early childhood, to examine teachers' perspectives on the use of digital media in the potential of interactive digital book media as a tool for integrating earthquake disaster mitigation education, and to understand the challenges and obstacles in implementing interactive digital book media. The participant in this study was a teacher at TK Plus Elhafa Cikarang. A teacher is selected based on consideration of teaching experience of more than 7 years so that she already knows about the material that is appropriate to the characteristics of early childhood, has used digital media in learning, and has an interest in digital learning media. Data collection techniques were conducted through in-depth interviews, observations, and documentation. The types of data collected were primary and secondary data. Primary data included results from in-depth interviews, direct observation results, documentation results, and participant data. Secondary data, as supplementary data, were obtained through literature, articles, and scientific journals related to the research. Subsequently, data validity was ensured through comprehensive data triangulation by systematically combining data from various collection methods and performing document analysis of existing media and learning methods that had been previously utilized in the educational setting. The research analysis employed Saldana's (2015) thematic analysis coding technique through a systematic four-phase process, initial coding or code assignment to break down collected data into meaningful and manageable segments, categorizing to identify recurring patterns and relationships within the coded data, theming to elevate identified patterns into coherent main ideas and overarching concepts, and comprehensive reporting to present the research findings in a clear and academically rigorous manner that would contribute to understanding teachers' experiences with earthquake disaster mitigation education and digital media implementation in early childhood contexts. This study used Saldana's (2015) thematic coding analysis technique because this method allows researchers to identify hidden patterns of meaning in complex qualitative data,

particularly in understanding the subjective experiences of teachers as primary users of learning media. Thematic analysis can reveal teachers' perspectives on the concept of disaster mitigation, the potential of interactive digital media, and the challenges of its implementation, which can then be elaborated into meaningful findings.

Result and Discussion

1. Teachers' Understanding of the Concept of Disaster Mitigation Education

The professional responsibility of a teacher encompasses mastery of various skills, from teaching abilities, classroom management, to designing learning programs (Dewi et al., 2022). Early childhood teachers have more complex roles than merely being instructors, as they serve as children's first educators outside the home who will influence children's welfare. In short, early childhood teachers are central figures who lay important foundations for children's character development and intelligence in the future. Based on interview data, it is clearly shown that teachers understand disaster mitigation education as a process of providing knowledge to children about strategies and actions that must be taken when facing disasters. Teacher as a subject of this research specifically stated:

Disaster mitigation can be in the form of providing information to children about disasters, such as what to do if we face disasters (Interview, June 5th 2025).

The emphasis on the 'facing' aspect indicates that teachers prioritize response readiness and concrete actions that children can take. Teachers also mentioned always being prepared because Indonesia's position is highly vulnerable to disasters. In preparing humans who are ready and alert to disasters, it is highly recommended to start from an early age. Disaster mitigation can be given to early childhood by introducing the factors that cause earthquake disasters, children can be introduced to the signs that appear before a disaster occurs and trained to carry out self-rescue simulations (Dewi, 2022; Boon, 2015; Crellin and Johnston, 2012; Ronan, 2012; Back, 2009).

This is believed that mitigation education started from an early age can equip children with essential self-rescue skills, thereby reducing the risk of casualties and losses caused by disasters in the future (Atmojo, 2020). Therefore, providing disaster mitigation education from an early age will reduce the number of disaster casualties. Furthermore, teachers explicitly acknowledge and emphasize the absolute urgency of introducing disaster mitigation education from an early age. Early childhood is a crucial period in cognitive development and the formation of behavior and moral values that will shape children's personalities in the future (Afnan et al., 2024). Therefore, by providing disaster mitigation education from an early age, it will form children's disaster-alert attitudes. Teachers express this with strong arguments:

Disaster mitigation education is very important to be given, but through ways that children understand because children always think concretely (Interview, June 5th 2025).

The statement concrete reflects teachers' pedagogical understanding that early childhood children learn most effectively through direct experience, real objects, or concrete representations, not merely through abstract concepts. This is supported by research showing that involving children directly in learning can make learning more meaningful for children, so that meaningful learning will be stored in the brain for a long time (Sari and Astuti, 2018). Therefore, early mitigation introduction in the right way will be more easily absorbed and memorable in children's memory.

Additionally, teachers also show high awareness of unpredictable global conditions and risks, which significantly strengthen their arguments about the importance of early preparedness. This is supported by research revealing that considering natural disaster threats that can occur anytime and anywhere, children need to be given

knowledge and training to be prepared to face natural disasters (Rahiem and Widiastuti, 2020). Preparedness can reduce damage caused by disasters and can encourage children to prepare themselves more carefully in facing disasters (Dewi, 2022; Yeon, Chung and Im, 2020).

Children's participation in disaster risk reduction produces many benefits for children, not only preparedness for disasters, but also including increased skills, development of self-efficacy, interpersonal relationships, and better social community relations (Dewi, 2022; Pfefferbaum et al., 2018). The implementation of earthquake disaster mitigation education in schools has been carried out through the assistance of learning media and methods. Learning media and methods play very important roles in earthquake disaster mitigation material because they can make earthquake material easier for children to understand.

The use of learning media in the teaching and learning process is believed to foster learning interest, generate learning motivation, and even provide psychological influence on learning (Wulandari et al., 2023). Teachers acknowledge that mitigation materials, especially abstract concepts such as earthquakes, become easier for early childhood children to understand when presented through attractive and concrete media. Disaster mitigation education in schools has been implemented with the help of animated story video-based learning media.

Regarding teaching methods considered most effective for earthquake disaster mitigation topics, teachers express their preference for a combination of more interactive and practical approaches. Teachers choose the role-playing method as an effective method in disaster mitigation education because it allows children to actively practice earthquake scenarios in safe and controlled environments. Through this activity, children can develop their imagination to envision earthquake emergency situations, making disaster mitigation learning easier to digest and enjoyable when done with friends and teachers (Rohmah et al., 2025).

Additionally, teachers also highly recommend role-playing approaches or practical simulations, which can train children about what to do physically when earthquakes occur, such as taking shelter under tables, staying away from glass, conducting evacuations, and so forth. In providing earthquake disaster mitigation education, teachers found and identified several significant challenges when attempting to teach earthquake disaster mitigation education concepts to early childhood children, which directly affect the methods and media that can be used. The main challenge faced relates closely to the abstract nature of earthquake phenomena themselves.

Unlike concrete concepts that can be demonstrated or touched, earthquakes are natural events that are difficult to fully visualize by children without direct experience. In learning, in line with Piaget's cognitive theory, children at the preoperational stage require real experiences to understand more complex concepts (Istiqomah and Maemonah, 2021). Cognitive development is the process of change and growth that occurs in the ability to think and understand the world as we age, encompassing changes in how individuals acquire knowledge, process information, solve problems, remember, pay attention, and reason (Babullah, 2022; Cross and Israelit, 2021).

Therefore, when a disaster occurs, children need to think and remember what needs to be done to resolve the disaster, such as an earthquake. Jean Piaget developed a theory of cognitive development that emphasizes the important role of interactions between children and their environment in building knowledge and understanding of the world. Besides the abstract nature of earthquakes themselves, another significant challenge expressed by teachers is the inability to provide direct information essentially to early childhood children. This means teachers cannot simply give facts or instructions

straightforwardly and expect children to understand immediately. Children need gentler introductions, such as through stories, games, or other interesting activities to absorb information.

Therefore, teachers need to have good strategies in creating interactive and enjoyable learning environments (Gea and Zega, 2025). This process requires extra patience and teachers' ability to package heavy material into something light and enjoyable. In facing that challenge, teachers currently rely on video-based learning obtained from YouTube platforms. Using videos becomes a popular choice for teachers because of their ability to present information visually and auditorily, suitable for early childhood learning styles:

So, children absorb information through videos synchronously, between what they see and what they hear (Interview, June 10th 2025).

This is supported by research results revealing that using audio-visual media is suitable for increasing interest and learning concentration in early childhood, which will also encourage children's interaction in learning (Firdausih et al., 2025). After video screening sessions, teachers implement feedback mechanisms to ensure children's understanding. This feedback can be in the form of simple discussions, questions, or brief activities to measure how far children capture messages conveyed through videos, while clarifying if there are misunderstandings.

2. Teachers' Perspectives on Interactive Digital Book Media Based on Earthquake Disaster Mitigation Education

Digital learning media are believed to be effective platforms for children to explore and express their imagination (Burke et al., 2023). Interactive digital book media based on earthquake disaster mitigation education is one form of digital media resembling e-books but interactive in nature because it invites children to actively participate in learning with features including text, video, audio, photos, and even games. This digital book media is assisted by a website that can facilitate users to be creative and help in learning. This interactive digital book media can be accessed through websites with the help of PCs, laptops, tablets, or smart TVs.

Unlike ordinary digital books that usually only contain text and images, this digital book offers various features, hence the term interactive in this media. The interactivity in this media means children do not just see, watch, or listen. However, children can take pictures, record sounds, scribble like making lines, and even move elements from one place to another. This media pays attention to and adjusts to early childhood characteristics, such as many colors, attractive images, easy instructions, simple language, and other aspects.

Even for early childhood children who cannot read fluently, audio features are prepared so that instructions or information being conveyed still reach children without children having to read them. Through screen-based digital media, children can learn and obtain information from digital media through transfer learning, where they receive information and then apply their knowledge to real life in daily routines (Qaiser, 2020; Lerner and Barr, 2015). When introduced to the interactive digital book prototype, teachers provided very comprehensive feedback dominated by positive impressions. Teachers' initial reaction to the visual display was very appreciative, describing it as:

Good, brightly colored, with many attractive pictures (Interview, June 10th 2025).

Colorful images are believed to help build children's enthusiasm so that children can understand learning well (Rupnidah and Suryana, 2022). This appreciation shows that the aesthetic aspects and visual appeal of the digital book successfully captured teachers' attention, which is an important indicator for early childhood learning media.



Picture 2. Interactive Digital Book Cover Based on Earthquake Disaster Mitigation

Additionally, teachers also appreciated the character introduction in the book. The presence of characters can help children build emotional connections and make stories easier to follow, thus increasing their involvement in the learning process. When asked to identify features that attract attention, teachers pointed to visual features, particularly photo taking feature.



Picture 3. Photo-Taking Feature

The teacher explained:

Because in this photo section, children will role-play as if an earthquake is happening, so they protect themselves while hiding under the table, so children know what should not be done when an earthquake occurs, such as not panicking, not crying, not jumping to windows (Interview, June 13th 2025).

This perspective shows that photo elements depicting concrete mitigation actions such as taking shelter under tables when earthquakes occur can serve as direct visual references for role-playing activities. This will help children visualize and practice safety procedures relevant to earthquakes. Teachers also believe that having such photo elements will increase children's involvement and enthusiasm. Through this activity, children can develop their imagination to envision earthquake emergency situations, making earthquake mitigation learning easier to remember, especially when done with teachers and friends (Rohmah et al., 2025).

The application of the role play learning method in schools has an important role for students in educating them about the actions that must be taken when facing a disaster, as evidenced by the significant difference in students' preparedness attitudes before and after the application of the disaster role play method (Junianto and Hendriani, 2023). Teachers also believe that using this role-playing learning method is more effective and easily stored in children's brains. The schools located in earthquake-prone areas in Türkiye, to improve the disaster preparedness of school-aged children, several drills are conducted regularly in schools due to the Disaster Week held annually and the results are proven to increase children's alertness (Ersoy and Koçak, 2016).

The use of game-based visual media has a positive impact on educating children about earthquake disaster mitigation, as evidenced by the fact that children's scores from the games they play tend to increase daily (Rahadian et al., 2017). Therefore, according to teachers, combining visual media with role-playing learning methods can serve as a reference in providing education about earthquake disaster mitigation. This further

strengthens teachers' views that visual media connected to physical activities is key to success in integrating abstract earthquake mitigation concepts into concrete and enjoyable learning experiences for children. The use of interactive digital book media based on earthquake disaster mitigation education is assessed by teachers as being firmly considering this media very suitable for early childhood. This assessment is based on media characteristics that are interactive and attractive according to early childhood characteristics. Teachers also stated that the presented material is appropriate for children's age and the language used is easily understood by children. Additionally, teachers also noted the uniqueness of this media in their environment, expressing:

There are no digital book media like this yet, especially here (Interview, June 10th 2025).

This acknowledgment of uniqueness indicates great potential for this media to become significant innovation in disaster mitigation learning in early childhood education. Regarding content suitability in the digital book prototype, teachers considered it adequate for early childhood education level, giving good assessments. Teachers emphasized the importance of short but effective material duration. This shows teachers' understanding of early childhood children's limited attention spans, so material presentation must be efficient and not lengthy for mitigation messages to be conveyed optimally. This is supported because children have relatively short concentration spans, making them easily bored (Aziz et al., 2022). Overall, teachers assessed this media's effectiveness very highly, even giving a score:

This scores 90% good and the media can be used (Interview, June 10th 2025).

This number reflects teachers' optimism and confidence in the implementation potential of this interactive digital book in learning. This is supported by observation results regarding digital media feasibility and material aspects within it valued at 95.5% effective for implementation with children. The interactive feature aspect of this digital book is highly valued by teachers because of its impact on children's learning. Teachers noted that this media can convey information well, making it easily remembered by children. This interactivity not only attracts children's attention but also offers the use of various senses, as teachers explained:

Children can see, hear, and their motor skills are also stimulated (Interview, June 10th 2025).

The involvement of all senses is very beneficial for early childhood cognitive development. This is supported because children at the preoperational stage involve all their senses to develop their cognitive abilities (Nurtaniawati, 2017; Hedges, 2014). Learning experiences involving more senses tend to produce deeper and more holistic understanding. This shows that teachers see interactive digital books as powerful tools to facilitate active and comprehensive learning about earthquake disaster mitigation.

3. Teachers' Challenges in Implementing Interactive Digital Book Media Based on Earthquake Disaster Mitigation Education

Addressing the aforementioned difficulty of explaining abstract concepts, the teacher confirmed that the interactive digital book effectively translated the nature of an earthquake into accessible language and relevant activities for the children. Despite having positive views, teachers also identified several significant practical challenges that could hinder optimal implementation of interactive digital books. The main concern expressed by teachers is the limitation of available device screen sizes. Teachers stated that the tablet screen used as the main facility is too small. This limited screen size is expected to affect media usage effectiveness because it requires additional time in the learning process:

It might take longer and children will likely compete to see the screen (Interview, June 13th 2025).

This implies that small screens might make it difficult for all children to see clearly simultaneously, so teachers must arrange turns or repeat explanations, ultimately consuming more lesson time. The limitation of facilities and supporting tools becomes a crucial point. Teachers explicitly mentioned facilities and tools as main obstacles. Teachers believe that if larger facility tools such as smart TVs were available, it would provide much greater flexibility from various aspects. In terms of size, smart TVs would allow all children to see content clearly. In terms of time, learning would be more efficient because teachers would no longer need to repeat or bring children closer one by one. And equally important, smart TVs would increase children's satisfaction in viewing the media because of clearer visual experiences. Apart from facility issues, the most significant main implementation challenge identified by teachers is classroom management, namely efforts to:

Condition children to remain orderly (Interview, June 13th 2025).

This challenge arises because of children's high enthusiasm for new technology: Children will be very excited about everything new they encounter (Interview, June 13th 2025).

Research results reveal that digital technology can build children's enthusiasm and interest in learning (Surya et al., 2024). Children's excitement and curiosity about interactive digital media, although positive for learning motivation, can also cause them to become overly active or difficult to manage. This demands competent classroom management skills from teachers to direct children's positive energy into focused and directed learning. Nevertheless, amid facility challenges, teachers still find that this interactive digital book media is easy to operate. This shows that the interface design or media navigation has been well-designed, so the main obstacle is more on infrastructure rather than the complexity of using the media itself.

Conclusion

Interactive digital book media based on earthquake disaster mitigation education is a significant pedagogical breakthrough in overcoming the fundamental challenges of teaching abstract disaster concepts to early childhood learners. This study shows that when educational technology is designed with consideration of the developmental characteristics of early childhood through the integration of multisensory engagement, concrete visual representations, and interactive elements, the media can successfully bridge the gap between complex scientific phenomena and children's cognitive capacities, as reflected in teacher assessments that provide a 90% effectiveness rate and observation results that show 95.5% implementation effectiveness. Theoretically, this study strengthens the implementation of Piaget's cognitive theory in the context of disaster mitigation education for early childhood, proving that children at the pre-operational stage require a concrete learning approach that involves all senses, and enriches the literature on the use of digital technology in early childhood learning by demonstrating that digital media specifically designed with consideration of limited attention spans, simple language, engaging visualizations, and audio features can optimize learning effectiveness. From a practical perspective, this media provides a concrete solution to the limitations of conventional learning methods that have relied on YouTube videos and lectures, offering interactive features such as taking pictures, recording sound, and virtual role-playing that transform disaster mitigation learning into a fun and meaningful activity. This research has broad implications for the development of disaster mitigation learning media at the early childhood education level, indicating the need for media design that

prioritizes multisensory interactivity, content with optimal duration according to children's attention span, the use of characters that build emotional connections, and standardization of interactive features in the development of learning media, although optimal implementation requires overcoming infrastructure challenges such as limited device screen size and classroom management training for early childhood teachers.

References

- Abdillah, R., Kuncoro, A., Erlangga, F., & Ramdhan, V. (2022). Pemanfaatan Aplikasi Kahoot! Dan Quizizz Sebagai Media Pembelajaran Interaktif Berbasis Gamifikasi. *Jurnal Pendidikan Sains Dan Komputer*, 2(1), 92-102.
- Afnan, A., Aswir, A., & Haidir, H. (2024). Pendidikan Karakter Pada Anak Usia Dini. *Jurnal Literasiologi*, 9(4).
- Anggarasari, N. H., & Dewi, R. S. (2019). Mitigasi Bencana Pada Anak Usia Dini. *Jurnal Pendidikan: Early Childhood*, 3(1), 1-9.
- Ao, Y., Hongying, Z., Linchuan, Y., Yan, W., Igor, W., & Gang, W. (2021). Impacts Of Earthquake Knowledge And Risk Perception On Earthquake Preparedness Of Rural Residents. *Natural Hazards*, 107(2), 1287-1310.
- Atmojo, M. E. (2020). Pendidikan Dini Mitigasi Bencana. *Jurnal Abdimas BSI: Jurnal Pengabdian Kepada Masyarakat*, 3(2), 118-126.
- Ayu, F., & Fauzi, A. (2021). The Validity Of The E-Book On Integrated Physics For Earthquake Disaster Mitigation Materials. *International Journal of Progressive Sciences and Technologies*, 25(1), 35.
- Aziz, H., Inten, D. N., Mulyani, D., & Permatasari, A. N. (2022). Pendampingan Penyusunan Perencanaan Pembelajaran Berbasis Mitigasi Bencana Di Lembaga PAUD Kabupaten Bandung. *Jurnal Pendidikan Tambusai*, 6(1), 7955-7960.
- Babullah, R. (2022). Teori Perkembangan Kognitif Jean Piaget Dan Penerapannya Dalam Pembelajaran. *Epistemic: Jurnal Ilmiah Pendidikan*, 1(2), 131-152.
- BNPB. (2025). *Data Informasi Bencana Indonesia*. Badan Nasional Penanggulangan Bencana Indonesia.
- Burke, A., Kumpulainen, K., & Smith, C. (2023). Children's Digital Play As Collective Family Resilience In The Face Of The Pandemic. *Journal of Early Childhood Literacy*, 23(1), 8-34.
- Chai, J., & Wu, H. Z. (2023). Prevention/Mitigation Of Natural Disasters In Urban Areas. *Smart Construction and Sustainable Cities*, 1(1), 1-16.
- Dewi, D. J. K. (2022). Pentingnya Pembelajaran Mitigasi Bencana Untuk Anak Usia Dini Di Indonesia: Sebuah Tinjauan Literatur. *Annual Conference on Islamic Early Childhood Education (ACIECE)*, 6, 15-22.
- Dewi, F., Justicia, R., & Bayuni, T. C. (2022). Pelatihan Media Berbasis Teknologi Untuk Meningkatkan Kompetensi Guru PAUD. *MARTABE: Jurnal Pengabdian Masyarakat*, 5(1), 291-300.
- Ersoy, Ş., & Koçak, A. (2016). Disasters And Earthquake Preparedness Of Children And Schools In Istanbul, Turkey. *Geomatics, Natural Hazards and Risk*, 7(4), 1307-1336.
- Firdausih, I., Travelancya, T. D., & Ali, M. (2025). Implementasi Pembelajaran Berbasis Audio Visual Dalam Meningkatkan Konsentrasi Belajar Anak Usia 5-6 Tahun Di RA Nurul Islam. *IJIGAE: Indonesian Journal of Islamic Golden Age Education*, 6(1), 13-21.
- Fransiska, K. A. W., Suarni, N. K., & Margunayasa, I. G. (2024). Perkembangan Kognitif Siswa Pada Penggunaan Media Pembelajaran Digital Ditinjau Dari Teori Jean Piaget: Kajian Literatur Sistematis. *JIIP: Jurnal Ilmiah Ilmu Pendidikan*, 7(12), 13557-13561.

- Gea, A., & Zega, R. F. W. (2025). Metode Pembelajaran Kreatif dalam Pendidikan Anak Usia Dini. *Khirani: Jurnal Pendidikan Anak Usia Dini*, 3(1), 209-219.
- Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding The Role Of Digital Technologies In Education: A Review. *Sustainable Operations and Computers*, 3, 275-285.
- Irawan, I., Subiakto, Y., & Kustiawan, B. (2022). Manajemen Mitigasi Bencana Pada Pendidikan Anak Usia Dini Untuk Mengurangi Risiko Bencana Gempa Bumi. *PENDIPA Journal of Science Education*, 6(2), 609-615.
- Istiqomah, N., & Maemonah, M. (2021). Konsep Dasar Teori Perkembangan Kognitif Pada Anak Usia Dini Menurut Jean Piaget. *Khazanah Pendidikan*, 15(2), 151-158.
- Insany, G. P., Lutfi, A. M., Fatah, A. A., Putri, A., Nuralam, F., Fauzan, M. A., Fulkiyana, M., & Melani, R. R. (2024). Implementasi Pemanfaatan Media Digital Untuk Sosialisasi Siaga Bencana Dini. *Jurnal Pengabdian Kepada Masyarakat Abdi Putra*, 4(2), 141-144.
- Junianto, D., & Hendriani, D. (2023). Pengaruh Model Simulasi Bencana Terhadap Nilai Sikap Kesiapsiagaan Siswapada Mata Pelajaran Ilmu Pengetahuan Sosial. *CENDEKIA: Jurnal Penelitian Dan Pengkajian Ilmiah*, 1(1), 47-55.
- Justicia, R., Maulani, A. S., Sulistyowati, W., Adzkia, K. P., & Ainurrahmah, S. (2023). Smart Book Berbasis Program Keselamatan Diri Anak Usia Dini. *Jurnal Pelita PAUD*, 8(1), 60-66.
- Kartika, M. Y., Ardhyantama, V., & Tisngati, U. (2023). Pengembangan Media Buku Cerita Bergambar Untuk Meningkatkan Pemahaman Anak Tentang Mitigasi Bencana. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, 13(1), 76-86.
- Khambali, K., Inten, D. N., Mulyani, D., Lichandra, F., & Tiwi, D. (2021). Peran Orang Tua Terhadap Pembelajaran Mitigasi Bencana Bagi Anak Usia Dini Di Masa Covid-19. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 6(3), 1881-1896.
- Kurniasih, E. (2019). Media Digital Pada Anak Usia Dini. *Jurnal Kreatif: Jurnal Kependidikan Dasar*, 9(2), 87-91.
- Li, J., & Zhou, Y. (2020). Optimizing Risk Mitigation Investment Strategies For Improving Post-Earthquake Road Network Resilience. *International Journal of Transportation Science and Technology*, 9(4), 277-286.
- Lilianti, L., Bian, Y., Jaya, A., Mokodompit, M., Juhadira, J., & Herlian, H. (2023). Transformasi Siaga Bencana: Membangun Safety Culture Melalui Pendidikan Kebencanaan Di Satuan PAUD. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 7(5), 6215-6223.
- Narayana, I. G. B., Sukarja, I. M., Sukawana, I. W., Juniari, N. M., (2022). Edukasi Media Audiovisual Meningkatkan Kesiapsiagaan Siswa Dalam Menghadapi Bencana Gempa Bumi. *Jurnal Gema Keperawatan*, 15(2), 160-171.
- Nurani, Y., Hapidin, H., Wulandari, C., & Sutihat, E. (2022). Pengenalan Mitigasi Bencana Banjir Untuk Anak Usia Dini Melalui Media Digital Video Pembelajaran. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 6(6), 5747-5756.
- Nurtaniawati, N. (2017). Peran Guru Dan Media Pembelajaran Dalam Menstimulasi Perkembangan Kognitif Pada Anak Usia Dini. *Tunas Siliwangi: Jurnal Program Studi Pendidikan Guru PAUD STKIP Siliwangi Bandung*, 3(1), 1-20.
- Oktaria, R., Windah, A., Nurhaida, I., Putra, P., & Haerudin, N. (2023). Pembelajaran Mitigasi Bencana Berbasis Literasi Informasi Untuk Meningkatkan Disaster Self Awareness AUD. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 7(2), 2109-2122.

- Putri, W., Leuwol, F. S., & Lasaiba, M. A. (2024). Peningkatan Pemahaman Mitigasi Bencana Peserta Didik Melalui PBL. *GEOFORUM: Jurnal Geografi Dan Pendidikan Geografi*, 3(2).
- Qaiser, Z. (2020). Early Childhood Education And Care And The Use Of Digital Media In Informal Environments. *Berkeley Review of Education*, 9(2).
- Rahadian, K., Affan, M., & Restu, R. (2017). GEMPA: Game Edukasi Sebagai Media Sosialisasi Mitigasi Bencana Gempa Bumi Bagi Anak Autis. *Jurnal Nasional Teknik Elektro dan Teknologi Informasi (JNTETI)*, 6(2), 174-183.
- Rahiem, M. D. H., & Widiastuti, F. (2020). Pembelajaran Mitigasi Bencana Alam Gempa Bumi Untuk Anak Usia Dini Melalui Buku Bacaan Bergambar. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 5(1), 36.
- Rohmah, N. A., Dewi, R. K., & Muhaji. (2025). Simulasi Bencana Pada Anak Usia Dini. *MONSU'ANI TANO: Jurnal Pengabdian Masyarakat*, 8(1), 106-114.
- Rupnidah, R., & Suryana, D. (2022). Media Pembelajaran Anak Usia Dini. *Jurnal PAUD agapedia*, 6(1), 49-58.
- Sari, A. Y. & Astuti, R. N. (2018). Implementasi Pembelajaran Project Based Learning Untuk Anak Usia Dini. *Motoric*, 1(1), 10.
- Sari, E. R., Yusnan, M., & Matje, I. (2022). Peran Guru Dalam Meningkatkan Keaktifan Belajar Siswa Melalui Media Pembelajaran. *Jurnal Eduscience*, 9(2), 583-591.
- Sari, N., Dayurni, P., & Nur, M. (2023). Pengembangan Edu-Game Dalam Meningkatkan Kesadaran Mitigasi Bencana Untuk Anak Usia Dini. *Murhum: Jurnal Pendidikan Anak Usia Dini*, 4(2), 555-567.
- Sayekti, I. C., Susilawati, S. A., Pramudita, D. A., Johan, A. E., Yanto, B. T., Ningsih, S. D., Ismail, A., Rosyada, A. Q., & Tama, I. D. A. (2024). Development Of Earthquake Mitigation E-Book For Disability Student. *International Journal of Learning Reformation in Elementary Education*, 3(1), 13-28.
- Surya, S., Usman, U., Ilyas, S. N., Rahayu, R., & Safitri, N. (2024). Wordwall Open the Box: Cara Inovatif Mengajar Anak Usia Dini. *Jurnal Inovasi Pendidikan Dan Teknologi Informasi (JIPTI)*, 5(1), 114-125.
- Ubaidillah, R., Putri, D., Hauri, Y., Yuliani, R., Utami, W. S., & Amanda, R. S. (2024). Lift The Flap Book: Media Untuk Menstimulasi Kesadaran Bencana Pada Anak Usia Dini. *Journal of Education Research*, 5(3), 2565-2572.
- Warsono, H., & Buchari, R. A. (2019). *Kolaborasi Penanganan Bencana*. Trim Komunikata.
- Widanty, T., & Pamungkas, J. (2023). Pengembangan Media Flashcard Mitigasi Bencana Alam Gunung Meletus Untuk Anak Usia 5-6 Tahun. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 7(5), 5733-5744.
- Wiguna, I. B. A. A. (2021). Pelatihan Dan Pengembangan Keterampilan Mengajar Guru Pendidikan Anak Usia Dini. *SELAPARANG: Jurnal Pengabdian Masyarakat Berkemajuan*, 4(3), 533-539.
- Wijaya, O., & Isni, K. (2018). Pelatihan Penyusunan Rencana Evakuasi Bencana Di Sd Muhammadiyah Se-Kecamatan Banguntapan, Bantul, DIY. *Jurnal Pemberdayaan: Publikasi Hasil Pengabdian Kepada Masyarakat*, 1(2), 413.
- Wulandari, A. P., Salsabila, A. A., Cahyani, K., Nurazizah, T. S., & Ulfiah, Z. (2023). Pentingnya Media Pembelajaran Dalam Proses Belajar Mengajar. *Journal on Education*, 5(2), 3928-3936.