MitiPedia: An Educational Mobile App Prototype for Enhancing Children's Preparedness in Indonesia

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Abstract: This study aims to develop *MitiPedia*, a mobile-based disaster mitigation application prototype designed specifically for children in Indonesia. Recognizing the country's high disaster vulnerability and the need for early disaster education, this innovation seeks to introduce preparedness concepts through interactive, age-appropriate, and culturally contextualized digital media. The development process employed the ADDIE instructional design model, consisting of five phases: Analysis, Design, Development, Implementation, and Evaluation. Findings suggest that *MitiPedia* has strong potential as a supplementary educational tool to enhance disaster literacy among children, especially in regions prone to natural hazards. Further testing in wider contexts is recommended to assess effectiveness at scale.

Keywords: Disaster Education, Mitigation, Children, Mobile Application

INTRODUCTION

Children in Indonesia remain a vulnerable group significantly impacted by natural disasters between 2021 and 2025, facing substantial physical and psychological challenges. For example, the November 2022 Cianjur earthquake (Pusat Data dan Informasi Kebencanaan, 2022) caused widespread damage, forcing many children into displacement and requiring trauma healing and psychosocial support for their recovery. Furthermore, the 2021 Seroja Tropical Cyclone in East Nusa Tenggara resulted in widespread stress and anxiety among children, particularly at Sekolah Alam Manusak, necessitating psychosocial support to help them cope with the trauma (Dinas Pendidikan dan Kebudayaan NTT, 2021). The 2021 Semeru eruption also had a significant psychological impact on children in Desa Supiturang, who required trauma healing therapy using puppet media to aid their recovery (BPBD Kabupaten Lumajang, 2021). In addition, the Galodo cold lava flood in West Sumatra in May 2024 traumatized young children, requiring play-based therapy using educational games to facilitate their recovery (Pemerintah Provinsi Sumatera Barat, 2024). Data from the Indonesian Child

Protection Commission (KPAI) reveals that in 2023, there were 70 reported cases of children affected by natural disasters, with approximately 45 million children living in earthquake-prone areas, 21 million in flood-prone areas, and 1.5 million in tsunami-prone areas. These findings highlight the crucial need for prioritizing disaster preparedness support for children in Indonesia.

Questionnaires administered to children in several disaster-prone areas in Indonesia revealed that most respondents lacked a comprehensive understanding of disaster mitigation techniques. A significant number of children admitted to being unaware of the necessary steps to take during disasters like earthquakes, floods, or fires. Moreover, most respondents felt that the disaster mitigation information received at school was insufficiently clear and easy to understand. Some children expressed confusion about their roles in emergency situations and how to protect themselves and their families. These findings underscore the need for improved disaster mitigation education programs that are more interactive, innovative, utilize current technology, and are age-appropriate, enabling children to understand and apply the correct procedures in emergency situations.

Disaster mitigation for Indonesian children is paramount given their high vulnerability to various natural hazards such as earthquakes, tsunamis, floods, volcanic eruptions, and landslides. Early disaster mitigation education equips children with the knowledge and skills to navigate emergency situations (Kurniawati & Wulandari, 2023). Numerous studies demonstrate the effectiveness of creative and contextualized approaches in enhancing children's understanding. For example, the use of digital media such as educational videos has proven to improve children's comprehension of flood mitigation (Rahmawati & Mulyani, 2019). Traditional games can also serve as effective tools for introducing disaster mitigation concepts to children (Sari & Hidayat, 2021). Research by Yuliani et al. (2021) also shows that visual media like digital posters can enhance children's absorption of disaster mitigation information, particularly when presented with bright colors and engaging characters. However, the lack of readily accessible digital applications via mobile phones presents a challenge for children's disaster preparedness.

A mobile disaster mitigation application for children is smartphone-based software designed to introduce disaster preparedness and response concepts in an engaging and easily understandable manner. The functional goals of this application are: (1) to convey disaster mitigation information visually and simply through easily understandable digital posters; (2) to enhance children's preparedness through key messages presented in an engaging and age-appropriate manner; and (3) to build a basic understanding of safety procedures during disasters through repeated visual cues and educational narratives. The mobile application will include information on disaster warning signs, evacuation procedures, and self-protection measures. A mobile application is more reliable because it resides on the child's phone or tablet, allowing for immediate and direct access in case of a sudden emergency. This practical and readily available aspect is often overlooked and under-developed.

This children's mobile application will be poster-based. Visual approaches like posters have proven effective in conveying educational messages to children because they align with their cognitive development, which is predominantly concrete operational (Santrock, 2011). According to Mayer (2009), combining text and images in multimedia learning strengthens comprehension through simultaneous visual and verbal channels. Research by Yuliani et al. (2021) also indicates that visual media such as digital posters can improve young children's understanding of disaster mitigation information, especially when presented with bright colors and appealing characters. Furthermore, according to Fleming (2001), visual learners grasp information more quickly when it is presented in structured and repetitive images. Therefore, a digital poster-based mobile application serves as an effective tool to equip children with the knowledge and skills to respond to emergencies quickly, meaningfully, and enjoyably, while retaining its significance (Azzahra & Mawardi, 2022).

METHOD

The implementation stage uses the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation):

During the analysis phase, a comprehensive needs assessment was conducted to understand the cognitive characteristics of children aged 7–11 years, as well as the specific challenges related to disaster education in Indonesian primary schools. This phase involved a literature review of national curriculum frameworks, disaster education policies, and studies on children's learning behaviors in high-risk areas.

In the design phase, the structure and layout of the application were carefully planned to align with the identified user needs. The design included a modular content structure covering disaster types, mitigation steps, evacuation procedures, and emergency preparation. Storyboards and wireframes were developed to outline the content flow and interaction pathways. Animated characters, icons, and color schemes were chosen to foster a positive and non-threatening learning environment.

The development phase focused on constructing the functional prototype of *MitiPedia*. Core features included: (1) animated explanations of common disasters such as earthquakes, floods, and volcanic eruptions; (2) gamified quizzes and mini-games to reinforce learning; (3) an interactive evacuation simulation to train appropriate response behavior; and (4) a "Disaster Preparedness Kit" module to introduce essential emergency supplies through engaging drag-and-drop activities. The prototype was developed to operate offline to ensure accessibility in low-connectivity regions.

The implementation phase was carried out through a small group trial, involving ten students from grades 3 to 5 in a public primary school. This pilot testing aimed to assess three main aspects: usability, content clarity, and learner engagement. Direct observation, guided play sessions, and semi-structured interviews were employed to gather both qualitative and quantitative feedback.

In the evaluation phase, data from the small group trial were analyzed alongside expert reviews from an educational technologist, a primary teacher, and a child psychologist. Based on this evaluation, minor revisions were made to improve language simplicity, icon placement, and quiz instructions.

RESULT AND DICSUSSION

RESULT

3.1 ADDIE development model (Analysis, Design, Development, Implementation, Evaluation)

During the analysis phase, a comprehensive needs assessment was conducted to understand the cognitive characteristics of children aged 7–11 years, as well as the specific challenges related to disaster education in Indonesian primary schools. This phase involved a literature review of national curriculum frameworks, disaster education policies, and studies on children's learning behaviors in high-risk areas. The analysis identified a gap in the availability of child-friendly, culturally relevant digital media for disaster preparedness. In addition, several issues were highlighted, such as children's limited attention span, difficulty in processing abstract disaster concepts, and the lack of engaging materials that could effectively deliver safety-related information.

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observation, guided play sessions, and semi-structured interviews were employed to gather both qualitative and quantitative feedback. The results indicated that most participants were able to navigate the app independently, demonstrated increased interest in disaster topics, and retained key mitigation concepts after using the app.

In the evaluation phase, data from the small group trial were analyzed alongside expert reviews from an educational technologist, a primary teacher, and a child psychologist. Based on this evaluation, minor revisions were made to improve language simplicity, icon placement, and quiz instructions. These improvements ensured better alignment with children's comprehension levels and enhanced the overall user experience. The evaluation concluded that the prototype was pedagogically sound and well-received by both users and experts, making it a viable candidate for broader field testing in future studies.

3.2 Prototype of the mobile application MitiPedia

Prototype of the mobile application MitiPedia is a technological innovation designed specifically to introduce the concept of disaster mitigation to children in Indonesia. With a fun and educational approach, this application aims to increase children's awareness and preparedness for natural disasters that frequently occur in various regions of Indonesia. Here are the application specifications:

1. Platform: Operating System: Android (minimum version 7.0 Nougat), with potential development for iOS.
2. Devices: Smartphones and tablets commonly used by children at home or at school.
3. Target Users: Children aged 7-12 years old.
4. Key Featurs

Feature	Description
Interactive Posters	Digital posters about different types of disasters containing information, voice narration, or simple animations
Visual Storie	Illustrated stories featuring children facing disasters, complete with educational messages

Audio & Narration	Audio narration to assist children who are not yet fluent readers

5. UI/UX Design

- Child-friendly design: large icons, bright colors, local cartoon characters.
- Simple navigation: swipe, tap, and back buttons with large size.
- Avoids long text, using images and audio instead.

6. Development Technology

- Frontend: Flutter (cross-platform), HTML5 for interactive content.
- Backend: User activity tracking.
- Multimedia: PNG posters, MP3 audio, lightweight Lottie or GIF animations.

7. Language: Indonesian.
8. Security & Privacy

- Does not collect children's personal data.
- Does not connect to the internet except for content updates.
- Does not display advertisements (due to educational focus).

9. App Size: Initial estimate: 30-50 MB, lightweight for download.

DISSCUSSION

Indonesia, located along the Pacific Ring of Fire and frequently exposed to natural disasters, requires serious efforts to enhance disaster preparedness, especially among children. Disaster education at an early age is vital in fostering awareness and equipping children with the knowledge and skills necessary to respond to emergencies effectively. In this context, *MitiPedia*, a disaster preparedness application specifically designed for Indonesian children, emerges as a promising educational innovation. It seeks to transform conventional, often monotonous disaster learning into interactive and engaging experiences. Research has shown that children tend to struggle with abstract material and easily lose interest when exposed to traditional methods (Arofah &

Wulandari, 2023), thereby justifying the need for interactive technological approaches in disaster education.

A core strength of *MitiPedia* lies in its gamified learning approach. Children are more likely to retain information when it is presented in the form of engaging, cognitively stimulating games. Through mini-games, interactive quizzes, and simplified simulations, the application introduces various types of disasters (e.g., earthquakes, floods, tsunamis, volcanic eruptions) along with appropriate mitigation and evacuation strategies. This aligns with recent findings that gamification enhances concentration and learning outcomes among young students, especially those who show low responsiveness and difficulty maintaining focus (Azizah & Wulandari, 2023; Sugara et al., 2023). Moreover, digital literacy tools with interactive components have been found to positively influence learning behaviors and reduce classroom disengagement (Sugara et al., 2023).

The application's visual and content design is carefully adapted to suit the cognitive development of children. Using simple language, animated characters, and vibrant illustrations, *MitiPedia* simplifies complex topics while reducing fear or anxiety about disasters. Additionally, it integrates elements of local wisdom, such as folklore and traditional stories related to natural phenomena, which foster cultural relevance and moral insight. This localization strategy echoes the approach adopted by Wulandari et al. (2025), who emphasized the importance of embedding indigenous knowledge and cultural identity in energy-efficient educational materials for primary school students.
Beyond content delivery, *MitiPedia* emphasizes behavioral training through simulated activities. Features such as the "Evacuation Simulation" allow users to virtually practice emergency responses in familiar environments like homes and schools. The "Disaster Preparedness Bag" feature, meanwhile, introduces children to the concept of assembling essential survival kits. This experiential approach supports the notion that knowledge must translate into actionable behavior to be effective (Setiani et al., 2023). Interactive digital media, when integrated with task-based learning, has proven beneficial in building applicable real-world skills among primary learners (Wulandari et al., 2023).

The development of *MitiPedia* was informed by multidisciplinary collaboration involving education specialists, child psychologists, and disaster management experts. This ensured that the pedagogical and psychological aspects of the content were tailored to Indonesian children's realities. Moreover, feedback from student focus groups was incorporated, allowing for user-centered improvements during the design phase. This participatory model of development aligns with current best practices in educational media design, particularly in projects involving younger learners (Wulandari et al., 2023).

Importantly, *MitiPedia* serves not only as a tool for children but also as a valuable resource for teachers and parents. The application includes modules specifically developed for adults, featuring instructional guides, suggested discussion points, and offline activity extensions that enhance comprehension and foster intergenerational dialogue on disaster preparedness. This dual-level approach creates synergy between formal school-based education and informal learning at home, as also advocated by Wulandari et al. (2023) in their Project-Based Learning (PjBL) initiatives in primary schools.

Nevertheless, the impact of *MitiPedia* will largely depend on its accessibility and dissemination. Ensuring its availability across diverse platforms mobile, web-based, and offline is essential to accommodate Indonesia's diverse socioeconomic and infrastructural contexts. Active promotion through schools, NGOs, and governmental campaigns is also vital for large-scale adoption. As Sumirah et al. (2023) emphasize, the effectiveness of educational media is not solely determined by its content, but also by how widely and equitably it is distributed and supported by community engagement.

In the long term, *MitiPedia* is expected to contribute significantly to the development of a disaster-aware and resilient generation. Children with adequate disaster literacy are more likely to become responsible adults who can protect themselves and contribute to the safety of their communities. This represents a long-term educational investment in national resilience. Studies such as Nurhillal et al. (2023) have demonstrated that structured, participatory learning approaches can significantly shape students' future preparedness and civic responsibility.

Finally, the educational contribution of *MitiPedia* aligns with international disaster risk reduction (DRR) agendas promoted by UNICEF and UNESCO, which advocate for inclusive and child-centered DRR education. By contextualizing these principles within the Indonesian socio-cultural and environmental landscape, *MitiPedia* stands as a responsive and innovative platform that supports the United Nations Sustainable Development Goals particularly those related to quality education and resilient infrastructure (Wulandari, 2015).

Overall, MitiPedia is a progressive step in efforts to improve disaster preparedness in Indonesia, particularly for children. With a combination of technology, effective pedagogy, and relevant content, this application has the potential to empower children with the crucial knowledge and skills to face future disaster challenges. This is a smart investment to create a more resilient Indonesian society.

CONCLUSION

The development of the mobile application prototype MitiPedia represents an educational innovation designed to enhance the preparedness and safety of Indonesian children in the face of natural disasters. Employing an interactive and child-friendly visual approach, the application effectively conveys crucial information about disaster mitigation in a simple, engaging, and easily understandable manner for primary school-aged children. The integration of digital poster-based visual content and educational narratives makes this application a relevant, adaptive, and technologically up-to-date learning tool for disaster education, addressing the specific needs of children in Indonesia. The application also supports national agendas to foster a culture of disaster awareness from an early age, as emphasized by the BNPB (National Disaster Management Agency) and Kemendikbud (Ministry of Education and Culture).

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