ENHANCHING DISASTER PREPAREDNESS THROUGH GAMIFICATION: THE MISSION: RESILIENCE PROGRAM IN KENDARI CITY HIGH-RISK SCHOOLS

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Abstract

This study aims to enhance disaster preparedness knowledge and skills among high school teachers and students in Kendari, Southeast Sulawesi, through a gamified educational approach called "Mission: Resilience." With the recognition of Kendari as a high-risk area for earthquakes, floods, and landslides, the project leverages gamification to improve engagement and learning outcomes in disaster readiness. The research involves a Participatory Rural Appraisal method, employing quizzes, flashcards, and simulations to deliver training on hazard mitigation, emergency response, and evacuation processes. Results from the pre and post-tests indicate a significant increase in disaster preparedness awareness and skills among participants. Additionally, the study confirms the effectiveness of integrating practical disaster simulations within the school curriculum. Ultimately, "Mission: Resilience" serves as a model for sustainable educational practices in disaster-prone regions, emphasizing continuous training and infrastructure enhancement to ensure long-term community resilience.

Keywords: Community Resilience, Disaster Preparedness, Emergency Response Training, Gamification,

INTRODUCTION

Indonesia, an archipelagic country located at the convergence of three major tectonic plates, faces a high risk of natural disasters (Qurotu A, 2020). According to Indonesia's Disaster Information Database (DIBI), Southeast Sulawesi Province experienced nine types of disasters between 2009 and 2019 (BNPB, 2021). In Kendari, part of this province, 723 earthquakes were recorded from 2019 to 2021(BMKG Southeast Sulawesi Province, 2022). Districts such as Mandonga and Poasia have been identified as high-risk earthquake zones, while Kendari Barat, Puuwatu, and Wua-Wua are prone to floods and landslides (BPBD Southeast Sulawesi Province, 2022). These circumstances indicate that the people of Kendari, especially those in disaster-prone schools, require enhanced preparedness to mitigate the

impact of disasters effectively.

Schools play a strategic role in preparing students as agents of change in disaster mitigation. However, schools located in high-risk areas, such as SMAS Kartika in Kendari Barat, have not fully developed their disaster preparedness strategies to address risks such as landslides and floods (Almuida et al., 2023; Ashariyanto et al., 2023). Observations at this school reveal that essential preparedness facilities, such as evacuation routes, are limited, and practical disaster training for students and teachers is not yet available. This situation increases the vulnerability of school communities, which could lead to severe consequences during a disaster. Additionally, disaster-related lessons are only provided through lectures in geography classes, without practical modules to effectively teach preventive actions (Saptaputra SK et al., 2023).

Implementing disaster preparedness programs in schools is crucial to ensuring that students and teachers are equipped to respond before, during, and after a disaster. Integrating disaster education into the curriculum, complemented by practical simulations, can strengthen the capacity of school communities to manage emergencies (Wicaksono & Sibuea, 2022). Previous studies demonstrate that students have the capacity to understand disaster concepts and serve as effective agents in disseminating preparedness information within their communities. Therefore, involving schools in disaster education programs is a significant step toward supporting community resilience in disaster-prone areas (Ashariyanto et al., 2023; Hidayat, 2020; Saptaputra SK et al., 2023).

Innovative approaches in disaster education, such as gamification, have also proven effective in enhancing students' understanding. A gamified learning model, such as the "Mission: Resilience" program, has been shown to increase student engagement and motivation. This approach allows students to learn through disaster simulations in an interactive digital environment, deepening their understanding of mitigation measures and evacuation procedures. The program aims to equip students and teachers at SMAS Kartika with practical skills that can be applied during emergencies (Nathaniel, 2023; Tri Kurniawan, 2023).

Based on the needs analysis at SMAS Kartika, the proposed solution includes improving the skills of students and teachers through disaster mitigation and evacuation training, as well as installing essential infrastructure such as evacuation routes. The implementation of this program will involve university students and lecturers through the Merdeka Belajar Kampus Merdeka (MBKM) initiative, ensuring that the research outcomes are directly applied to the community while also supporting the key performance indicators of higher education institutions. Moreover, this program aligns with the goals of the National Medium-Term Development Plan (RPJMN) and the Sustainable Development Goals (SDGs) in enhancing disaster preparedness and improving the quality of life.

The successful implementation of this initiative is expected to improve the disaster preparedness capacity of schools in high-risk areas such as SMAS Kartika. Active participation of teachers and students in disaster simulations, alongside gamified education, will serve as a strategic step in strengthening community resilience to disasters in a sustainable manner.

IMPLEMENTATION METHOD

The **"Mission: Resilience"** community service program aims to improve disaster knowledge and preparedness among participants at SMAS Kartika, located in the Kendari Barat District. This program targets five teachers and 20 students as the primary participants, focusing on flood and landslide mitigation, which are prevalent threats in the area. The program utilizes the Participatory Rural Appraisal (PRA) method, emphasizing active community participation through socialization, training, technology application, mentoring, and evaluation.

Materials and Tools

The materials and tools used in the program include:
a. Flashcards to facilitate gamified disaster education.
b. Training modules covering disaster mitigation, emergency response, and evacuation procedures.
c. The Quizizz platform for conducting pre-tests and post-tests.
d. Simulation tools, such as first-aid kits and equipment for role-playing evacuation scenarios.

Program Implementation Stages

The program is divided into several stages:
a. Socialization: Introducing the program's objectives and activities to the teachers and students.
b. Training: Delivering two types of training: Disaster mitigation and emergency response training; First aid and evacuation simulation exercises.
c. Technology Application: Integrating gamification into disaster education and utilizing digital platforms for knowledge assessment.
d. Mentoring and Evaluation: Embedding the training materials into the school curriculum and extracurricular activities, along with continuous monitoring and evaluation of the program's impact.

Data were collected using pre-tests and post-tests to measure participants' knowledge improvement. Additionally, observations were conducted during training and simulation sessions to monitor engagement and participation. Participant feedback was gathered through questionnaires and interviews after the program to gain insights into their perceptions of the activities. A comparative analysis of pre-test and post-test results will be conducted to evaluate improvements in participants' knowledge and disaster preparedness. Furthermore, qualitative analysis of the feedback and observations will provide a deeper understanding of participants' responses to the program.

The "Mission: Resilience" program is expected to significantly enhance disaster preparedness at SMAS Kartika, equipping students and teachers with practical skills and knowledge necessary to respond effectively to emergencies. The integration of gamification and hands-on simulations aims to create a sustainable impact by fostering proactive disaster preparedness in the school community.

RESULTS AND DISCUSSION
Disaster Mitigation Management Skills

The "Mission: Resilience" program resulted in a significant increase in the knowledge and skills of both teachers and students in disaster mitigation, emergency response, and evacuation management. The participants gained a comprehensive understanding of the sequence of actions required to respond to emergencies within the school environment. The effectiveness of the program was measured using pre- and post-tests, which revealed an increase in disaster management knowledge from 66% to 79%. This improvement also extended to first aid management, ensuring participants were better equipped to provide immediate care during disasters.

A total of 25 participants, comprising 5 teachers and 20 students, were involved in the program. The students, who were from grades 10 and 11, were divided into five groups, with each group consisting of one teacher, two male students, and two female students. Throughout the program, the participants displayed high levels of enthusiasm in engaging with the materials, demonstrating a strong desire to enhance their preparedness as disaster mitigation ambassadors for a disaster-resilient school.

The sessions were conducted interactively, utilizing audiovisual media and Quizizz for pre- and post-tests. All participants were already familiar with digital tools, which ensured their active participation in every activity. This interactive approach, combined with the use of digital platforms, enhanced the participants' learning experience, making the training both engaging and effective.

The program successfully fostered a proactive attitude among participants, equipping them with the necessary knowledge and practical skills to act as leaders in disaster preparedness. Their involvement as both learners and future disaster mitigation ambassadors is expected to contribute significantly to the development of a resilient school environment, promoting sustainable disaster management practices.
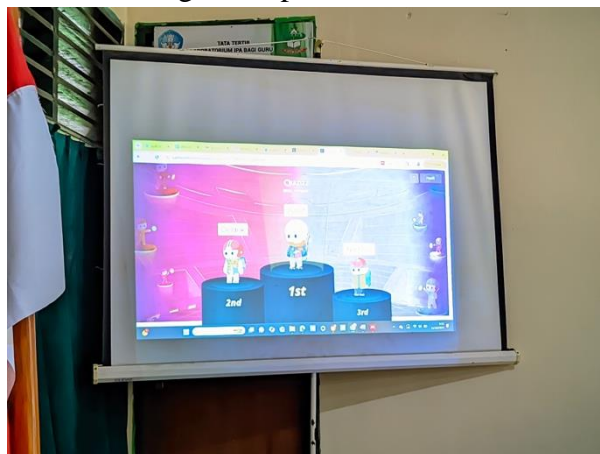

Figure 1. The Use of Quizizz in Disaster Management Education

The division of participants into small groups, consisting of one teacher and four students (two male and two female), promoted active engagement in understanding disaster response in schools. This method aligns with the concept of collaborative and participatory teaching, which has been shown to enhance the competence and disaster preparedness of school communities. Involving students from grades 10 and 11 as disaster mitigation ambassadors is a strategic step

toward creating a disaster-resilient school environment. Research indicates that the success of school-based mitigation programs depends heavily on active participation from both students and teachers, along with fostering their roles as agents of change within the school and the broader community (Basyith & Fauzi, 2022).

The use of Quizizz as a gamification tool in this community service program represents an innovative approach that integrates technology and education. Gamification, recognized as a 21st-century learning strategy, combines educational content with game mechanics to enhance motivation and student participation. In this program, all participants were already familiar with digital devices, allowing them to engage actively with Quizizz. This aligns with previous research indicating that tools like Quizizz can make learning more engaging, enjoyable, and motivational. Furthermore, gamification enhances teachers' mastery of educational technology, with 100% of participants successfully operating the platform and understanding its features. These findings highlight that gamification benefits both students and educators, particularly in building technological competencies and fostering innovation in teaching methods (Basyith & Fauzi, 2022; Efendi & Sesmiarni, 2022).

The idea that gamification can facilitate the development of collective knowledge, motivate students to engage more actively, and create positive learning experiences. This was reflected in the community service program, where both students and teachers demonstrated enthusiasm and curiosity in learning about disaster mitigation. Quizizz, used for pre- and post-tests, served as an effective evaluation tool, providing immediate feedback to participants and encouraging active participation. However, previous studies, identified some limitations in using gamification, including internet connectivity issues and time constraints. These challenges should be considered in future implementations, especially in areas with infrastructure limitations (Ainna Al Firdausi et al., 2021; Efendi & Sesmiarni, 2022).

Enhancing Disaster Mitigation Skills through the Mission: Resilience Program

The "Mission: Resilience" program leverages gamification techniques using flashcards, the Quizizz platform, and role-playing activities to enhance disaster mitigation skills. The program is structured into five levels, each focusing on specific aspects of disaster management to ensure comprehensive training for participants.

Level 1: Disaster Mitigation

This level begins with a pre-test using Quizizz to assess participants' initial knowledge of disaster mitigation. Afterward, participants are provided with educational modules designed through gamified learning using flashcards. Upon completion, participants earn the "Disaster Preparedness Badge", recognizing their readiness in understanding disaster mitigation strategies.

Level 2: Emergency Response and Evacuation Procedures

At this stage, participants undergo training on emergency response and evacuation procedures tailored for flood and landslide scenarios. The session starts with a pre-test on Quizizz to evaluate participants' baseline knowledge regarding evacuation planning. Participants then receive educational content designed through gamification (flashcards) to deepen their understanding. Upon completing this level, participants earn the "Evacuation

Plan Badge".

Level 3: First Aid in Flood and Landslide Situations

This level focuses on teaching crucial first aid techniques, including Cardio-Pulmonary Resuscitation (CPR) and splinting, which are essential during flood and landslide emergencies. Groups demonstrating strong comprehension and application of these skills will be awarded the "Rescuer Badge" as recognition of their competency in emergency first aid

Level 4: Communication and Teamwork

Participants engage in emergency response and evacuation simulations, where each group develops evacuation routes and designs first-aid processes for disaster victims. Team members assign roles, with some acting as responders and others as victims. Groups are evaluated based on the following criteria:

a.   Knowledge and Preparedness: How well the group understands emergency response and first-aid procedures.
b.   Scenario Execution: The effectiveness of communication and teamwork during the simulation.
c.   Time Management: The group's ability to efficiently manage time during preparation and scenario execution.
d.   Presentation: The clarity and effectiveness of the group's presentation to the forum.

The group demonstrating the highest level of performance earns the "Field Coordinator Badge".

Level 5: Disaster Evacuation Simulation

In this final level, participants take part in a comprehensive evacuation simulation that integrates first-aid exercises with gamification elements, including the use of a panic button as an emergency alarm. This simulation tests participants' ability to respond effectively at various preparedness levels. The group with the highest performance is designated as "Disaster Mitigation Ambassadors" and awarded the "Crisis Management Master Badge".

Figure 2. Educational Flashcard Media and Gamification Badges for Levels 1-5

Figure 3. Gamification Pin Award Ceremony

The disaster mitigation training, implemented using gamified methods through Quizizz, flashcards, and role-playing activities, has proven effective in enhancing participants' skills. The Mission: Resilience program is divided into five levels, reinforcing challenges and rewards as motivational tools. This structure aligns with research emphasizing the importance of badges, level progression, and rewards in gamified learning to increase motivation and participation (Aditya et al., 2023; Yuniarti et al., 2022). The use of step-by-step challenges encourages participants to stay engaged, fostering intrinsic motivation and enhancing their involvement throughout the learning process (Anggraini et al., 2024).

Role-playing exercises were integrated into the simulation of evacuation and first aid scenarios, promoting active involvement and enhancing teamwork skills. This method supports previous studies showing that gamified learning builds soft skills, such as communication and collaboration (Gymnastiar, 2022). Through these activities, participants gain a deeper understanding of roles and responsibilities during emergencies, reflecting the 21st-century competencies of teamwork and problem-solving (Anggraini et al., 2024).

Each training level provides participants with badges such as "Disaster Preparedness" or "Crisis Management Master," awarded to groups that excel in the activities. This use of badges serves as both progress markers and motivational rewards, creating a satisfying learning experience and making participants feel recognized for their efforts (Aditya et al., 2023; Ariessanti et al., 2020; Efendi & Sesmiarni, 2022). These rewards not only enhance engagement but also reinforce participants' achievements, encouraging them to continue learning. In the final level, participants engage in an evacuation simulation, incorporating the use of a panic button as part of an emergency alert system. This activity teaches participants to respond quickly and effectively to emergencies, which is essential for disaster preparedness. Well-designed simulations provide deep contextual experiences, equipping participants with practical skills for real-life scenarios (Simaremare et al., 2022). Additionally, the simulation offers opportunities to practice time management, communication, and decision-making, which are critical components in emergency situations

(Anggraini et al., 2024; Hastuti & Sriyanto, 2023).

The results of this program demonstrate that integrating gamification into disaster mitigation training effectively enhances participants' skills, motivation, and preparedness. The combination of badges, role-playing exercises, and simulations provides an engaging and interactive learning experience (Ariessanti et al., 2020; Yuniarti et al., 2022). Furthermore, the use of Quizizz for pre- and post-tests simplifies the evaluation of participants' knowledge improvement and ensures active participation throughout the training sessions.

Beyond individual skill development, the program also contributes to building a disaster-resilient school community by preparing participants to become field coordinators and disaster mitigation ambassadors. Moving forward, technical challenges such as infrastructure and internet access need to be managed effectively to ensure smooth implementation. Overall, the program aligns with modern educational trends by integrating technology and gamification, creating an effective and enjoyable learning experience that promotes disaster preparedness at both individual and community levels.

CONCLUSION

The implementation of the Mission: Resilience program through gamified methods, including Quizizz, flashcards, and role-playing, has proven effective in enhancing the disaster preparedness skills, knowledge, and motivation of participants. The use of badges, level-based challenges, and interactive simulations provided engaging learning experiences, fostering teamwork, communication, and quick decision-making skills essential for disaster management. This program not only improved individual competencies but also contributed to building a disaster-resilient school community by preparing participants as field coordinators and disaster mitigation ambassadors. Moving forward, addressing technical challenges will be crucial to ensuring sustainable and effective implementation, aligning the program with modern educational trends that integrate technology for impactful learning.

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