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Innovation of the Teacher's Standby Guidebook in Elementary Schools as an Effort to Prepare for Disaster-Safe Education: Qualitative Perspective

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Abstract

Elementary schools in disaster-prone regions play a crucial role in instilling disaster awareness and preparedness skills at an early age. This study aimed to develop the Guru Siaga Guidebook as an innovation to support the *Satuan Pendidikan Aman Bencana* (SPAB) program in Ngantang District, Malang Regency. Using a Research and Development (R&D) approach with the ADDIE model (Analysis, Design, Development, Implementation, Evaluation), integrated with qualitative insights from interviews, observations, and user feedback, data were collected through surveys, interviews, observations, and expert validation. The analysis revealed that most schools lacked structured disaster preparedness procedures, contextual learning materials, and routine simulations. Teachers and students expressed the need for a practical, engaging, and context-specific guidebook. The developed product included modules on disaster introduction, mitigation, evacuation, and first aid, complemented by visuals and interactive activities. Validation by material and media experts rated the guidebook as feasible and relevant (Material S-CVI/Ave = 0.89; Media S-CVI/Ave = 0.86). Field trials involving nine teachers and 90 students showed increased teacher preparedness scores (from 62.3 ± 8.4 to 74.9 ± 7.2; Cohen's d = 0.64) and improved student accuracy in evacuation steps (from 68% to 83%). Findings provide preliminary evidence that the guidebook supports disaster education and enhances preparedness indicators, aligning with national and international frameworks for safe schools. The guidebook introduces three distinctive features: localized hazard case studies, project-based evacuation drills with assessment rubrics, and child-friendly SOP flowcharts.

Keywords: Disaster Preparedness Education; Safe School; Guidebook Innovation; Elementary Schools

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INTRODUCTION

Elementary schools play a pivotal role in instilling early disaster awareness and preparedness because elementary-aged children are a vulnerable group requiring special protection during disasters (Nasution et al., 2024; Nurhattati et al., 2019; Suryadi et al., 2024). In Indonesia's geographically and geologically diverse context, multiple natural hazards threaten continuity of teaching–learning processes and student safety (Ayuningtyas et al., 2021; Hanum et al., 2025; Putri et al., 2025; Zuhriyah & Rokhman, 2025). Disaster safety education equips students with knowledge of disaster types, early warning signs, and appropriate evacuation procedures, while

also shaping a disaster-aware, resilient young generation able to contribute to risk reduction in society (Atmojo, 2021; Ramli et al., 2025; Husain et al., 2023; Xu et al., 2025). At the school-system level, the Satuan Pendidikan Aman Bencana (SPAB; Disaster-Safe Education Unit) program aims to increase disaster awareness and management capacity across the school community, aligning safe facilities, school disaster management, and integrated disaster risk reduction education (Handayani et al., 2024; Wijayanti et al., 2025; Widowati et al., 2023, 2025; Das et al., 2025; Lilianti et al., 2023). SPAB implementation engages principals, teachers, students, and education staff in Disaster Management Plans that formalize mitigation, evacuation, and regular simulations—ideally embedded within curricular and extracurricular activities to build a sustained culture of safety (Rizzoli et al., 2024; Schwartz et al., 2023; Irwanto et al., 2024; Yulianti et al., 2025; Nasution et al., 2024; Pawlik et al., 2025; Rakuasa et al., 2024). In this study, the focal outcomes are the teacher preparedness index (0–100 scale) and student evacuation accuracy (e.g., route adherence and time benchmarks).

Ngantang District, Malang Regency, East Java—located in the Pacific Ring of Fire—is frequently exposed to earthquakes, floods, volcanic activity, and landslides and is often referred to as a "disaster supermarket"; the 2014 eruption of Mount Kelud exemplifies the area's high risk (Syiko et al., 2014). Our initial survey across nine elementary schools revealed that 78% had no written SOPs, only 22% conducted evacuation drills once a year, and the mean teacher preparedness score was 62.3 ± 8.4 (Initial Survey Data, 2025). These data point to a gap between hazard exposure and school preparedness, compounded by limited awareness of the centrality of teacher guidebooks for disaster response and by the scarcity of contextualized SPAB learning materials tailored to local needs—both of which impede routine integration of disaster education in classrooms (Ariani, 2021; Ovtšarenko, 2025; Fagundo-Rivera et al., 2025; Jordan et al., 2025; Mayasari et al., 2024). Prior work underscores that contextual, participatory, and readable resources—designed around local socio-cultural and environmental conditions and presented with interactive pedagogy—are critical to strengthening preparedness (Corneasari, 2025; Hulwah & Suriani, 2025; Desiana et al., 2023; Partini & Pinoa, 2023; Maliki et al., 2023; Valakas et al., 2025). In parallel, school-level socialization and frequent simulations, when supported by accessible guidance, can elevate understanding and skills across school residents (Putri Handayani et al., 2024; Achmad et al., 2025; Handayani et al., 2024; Wijayanti et al., 2025).

Evidence from multiple settings suggests that teacher-facing modules and guidebooks tailored to local hazards improve preparedness among both teachers and students (Asbanu et al., 2023; Taiebine et al., 2025; Hammada & Sampean, 2024; Lownsbery, 2025; Nasution et al., 2024). However, the widely used SPAB guide issued by BNPB (2022)—organized in three modules and largely checklist-based—offers limited contextualization for high-hazard districts and provides little embedded pedagogy or assessment. Good practice in guidebook design emphasizes locally relevant content, clear SOPs, and technical guidance for simulations, spanning risk identification, planning, implementation, and evaluation/follow-up (Kienitz et al., 2025; Marinelli et al., 2023; Andung et al., 2024; Cattari et al., 2024; Kant, 2021; Setyaningrum et al., 2021; Newnham et al., 2023). Participatory tools such as mind mapping and Google Forms are useful for needs assessment and evaluation during development (El-Jardali et al., 2025; Prasetya et al., 2025). Studies from disaster-prone schools (e.g., SD Negeri 71 Banda Aceh) show that such approaches facilitate

contextual material creation and sustained training (Maliki et al., 2023; Meilianingsih & Sugiyanto, 2022). Addressing the identified gap, the present study introduces the *Guru Siaga* (teacher-readiness) guidebook: four localized modules—disaster awareness, mitigation, evacuation, and first aid—enriched with child-friendly visuals, illustrated SOP flowcharts, and project-based evacuation drills supported by assessment rubrics and local case studies (Al-Thani & Ahmad, 2025; Baum & Stary, 2024; Hanham & Hendry, 2024; Prabowo et al., 2025; Taiebine et al., 2025b). In contrast to the generic BNPB (2022) framework, this design integrates localization, pedagogy, and measurement to provide teachers with practical, comprehensive, and engaging tools (Andung et al., 2024; Cattari et al., 2024; Corneasari, 2025; Hulwah & Suriani, 2025; Kienitz et al., 2025; Marinelli et al., 2023; Memi Mayasari et al., 2024).

Accordingly, this study aims to: (i) develop the *Guru Siaga* guidebook using ADDIE; (ii) achieve expert validation with S-CVI/ Ave ≥ 0.80; and (iii) improve teacher preparedness and student evacuation accuracy through a limited implementation trial in Ngantang elementary schools. While emphasizing quantitative indicators (content validity indices; pre–post change in preparedness scores and evacuation accuracy), the development incorporates qualitative insights from interviews, observations, and expert feedback—yielding a combined R&D–qualitative approach to ensure contextual relevance and practical uptake (Suryadi et al., 2024a; Ovtšarenko, 2025; Prabowo et al., 2025; Putri Handayani et al., 2024; Wijayanti et al., 2025; Achmad et al., 2025; Ariani, 2021). This study thus positions a localized, teacher-facing SPAB resource to address demonstrable capacity gaps in a high-risk district while aligning with national SPAB priorities and school-based disaster management practices (Widowati et al., 2023, 2025; Das et al., 2025; Lilianti et al., 2023; Rizzoli et al., 2024; Schwartz et al., 2023; Irwanto et al., 2024).

METHOD

Research Design

The Preparedness Teacher Guidebook: *Disaster-Safe Education Units in Elementary* Schools was developed using a Research and Development (R&D) approach in conjunction with the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) (Branch, 2010). The R&D framework was complemented with qualitative insights obtained from interviews, observations, and expert comments to ensure contextual relevance and usability of the guidebook. This design was chosen because it could be tailored to the needs of elementary schools in Ngantang District and demonstrated systematic utility in producing a tested educational product.

A Research and Development (R&D) approach based on ADDIE (Analysis, Design, Development, Implementation, Evaluation) was used (Figure 1). All development procedures were conducted in past tense, reflecting completed stages of design, validation, and revision. Based on the formulated problem, the research applied a development research method (Cameron et al., 2025; Roy et al., 2025; Valakas et al., 2025). The purpose of this development research was to produce and improve existing products while ensuring that the resulting guidebook was scientifically sound (Fajri et al., 2025).

The ADDIE chronology was as follows: (a) Analysis (March 2024): needs assessment and literature review; (b) Design (April–May 2024): module blueprint and illustrations; (c) Development (June 2024): prototype v1 validation; (d)

Implementation (July 2024): pilot at three schools; (e) Evaluation (August 2024): data analysis and product revision.

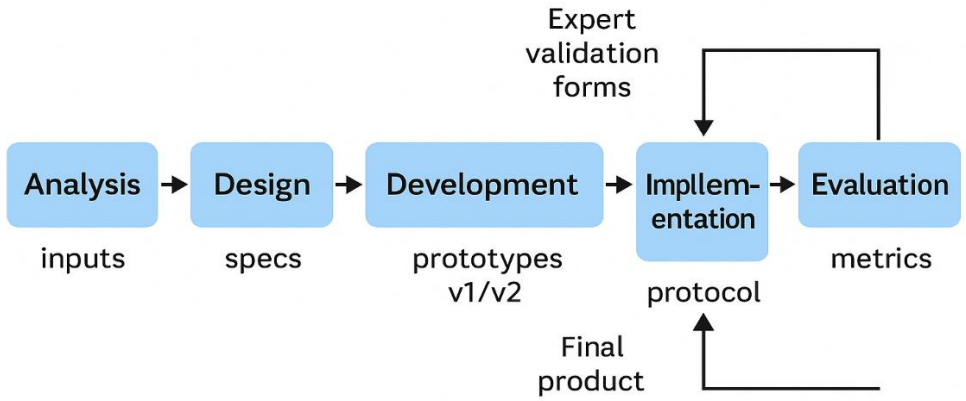

Figure 1. Research and Development based on the ADDIE Model

Research Context and Participants

The study was conducted in three elementary schools in Ngantang District: SD Negeri 3 Purworejo, SD Negeri 4 Pandansari, and SD Negeri 2 Waturejo. Participants consisted of nine teachers (average teaching experience = 11.3 years; none had prior SPAB training) and 90 students (Grades 4–6, aged 9–12). Although 10 teachers participated in the initial trial activities, complete pre–post data were available for only nine teachers, and this number (n = 9) was used consistently for quantitative analysis. Three experts were involved in the validation stage: two subject matter experts (disaster management/PMI) and one instructional media expert.

Development Procedures Based on ADDIE

Analysis

In the analysis phase, a survey of teachers' disaster preparedness needs was conducted through structured interviews and observations of the school environment. Literature studies and field observations at SD Negeri 3 Purworejo, SD Negeri 4 Pandansari, and SD Negeri 2 Waturejo were used to determine the specific needs of teachers and schools related to disaster preparedness, evacuation procedures, and school-based disaster risk reduction.

Design

In the design phase, a draft guidebook was created based on the results of the needs analysis. The design work included structuring the material, selecting and planning supporting illustrations, and drafting disaster standard operating procedures (SOPs) for school-level preparedness and evacuation. The design outputs comprised: (a) the material structure and sequence, (b) layout mock-ups of chapters and sections, and (c) flowcharts of disaster response SOPs tailored to the Ngantang District context.

Development

During the development phase, an initial product (prototype v1) of the guidebook was produced based on the design blueprint. Product development included the preparation of textual content, illustrations, and the integration of local

disaster risk information specific to Ngantang District, supported by illustrative scenarios and videos.

The initial prototype was then subjected to expert validation. Two independent experts assessed the appropriateness of the content (material relevance, accuracy of disaster concepts) and one media expert evaluated readability, visual design, and usability. Input from the experts was used to revise the content, structure, and layout of the guidebook before it proceeded to field trials.

Implementation

Following revision, the guidebook was trialed on a limited basis with 10 teachers from the three participating elementary schools in Ngantang District. The guidebook was piloted with teachers and students through classroom learning activities, evacuation simulations, and guided discussions to simulate real disaster-response situations in school.Teachers received a 2-hour training session covering: (i) using the guidebook as a learning resource, (ii) interpreting SOP flowcharts, (iii) organizing evacuation drills, and (iv) applying assessment rubrics for teacher preparedness and student performance during drills. The field trial aimed to determine the clarity of the content, the usefulness of the material, and the usability of the guidebook in a real-life school context. Data collection techniques during the limited trial included questionnaires, structured interviews, and observation checklists.

Evaluation

In the evaluation phase, formative and summative evaluations were conducted. Formative evaluation gathered ongoing feedback during implementation (e.g., teacher comments, observed difficulties, and student responses), which was used to refine the product. Summative evaluation focused on analyzing pre–post scores, expert validation results, and teachers' responses to determine the feasibility and effectiveness of the guidebook.

Instruments

Several instruments were used in this study to evaluate the feasibility of the guidebook and its impact on teacher preparedness and student knowledge.

Teacher Preparedness Questionnaire

The teacher questionnaire consisted of 15 items on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree; α = 0.87). An example item is: "I feel confident guiding students during evacuation drills." Raw scores (range 15–75) were converted to a 0–100 scale using Formula I.

$$\text{Converted score} = \left(\frac{\text{raw score}}{75}\right) \times 100 \quad \text{.....F1}$$

Student Evacuation Knowledge Test

Students' understanding of evacuation procedures was assessed using 10 items (KR-20 = 0.81). An example item is: "When an earthquake occurs, what should you do first?" Each item was scored 0 (incorrect) or 1 (correct); total scores were then converted to percentages.

Evacuation Drill Observation Checklist

The observation checklist included 12 criteria rated on a 4-point scale (0 = not demonstrated to 3 = fully demonstrated). The checklist covered key aspects of

evacuation steps, coordination between teachers and students, and response behaviors during drills.

Expert Validation Forms

Expert validation employed a 4-point relevance scale (1 = not relevant to 4 = highly relevant). The item-level Content Validity Index (I-CVI) was computed using Formula II.

$$\text{I-CVI} = \frac{\text{number of experts rating 3 or 4}}{\text{total number of experts}} \quad \text{F2}$$

The scale-level CVI (S-CVI/Ave) was calculated as the average of all I-CVI values across items. CVI calculations followed the widely used method proposed by Polit and Beck, which is appropriate for relevance-based validation.

Data Collection Procedures

Data collection combined quantitative and qualitative approaches. Quantitative data were obtained from:

- Expert validation scores of the guidebook,
- Teacher Preparedness Questionnaire (pre- and post-trial),
- Student Evacuation Knowledge Test (pre- and post-trial), and
- Observation checklist scores for evacuation drills.

Qualitative data were collected through structured interviews, field observations, and open-ended responses from teachers and experts. These qualitative data captured contextual feedback, perceived strengths and weaknesses of the guidebook, and suggestions for improvement.

Data Analysis

Data analysis was conducted using descriptive quantitative and qualitative methods (Dunn et al., 2025; Huang & Ma, 2025; Prieto et al., 2025). Quantitative data from validation and trial questionnaires were converted into feasibility categories (very feasible, feasible, fairly feasible, and not feasible) (Priore et al., 2025). The feasibility category was calculated using Formula 3.

$$\text{Feasibility category} = \left(\frac{\text{mean score}}{4}\right) \times 100\% \quad \text{F3}$$

The following cut-off points were applied:

- ≥ 87.5% = very feasible
- 75.0–87.4% = feasible
- 62.5–74.9% = fairly feasible
- < 62.5% = not feasible

CVI values ≥ 0.80 were interpreted as indicating valid items. Pre–post differences in teacher preparedness and student evacuation knowledge were tested using paired t-tests ($p < 0.05$). Effect sizes were calculated using Cohen's d to determine the magnitude of changes. Qualitative data from interviews, open responses, and expert

comments were analyzed thematically and used to refine the guidebook's content, structure, and presentation.

Ethical Considerations

The study was approved by the Ethics Committee of the Postgraduate Program of Universitas Muhammadiyah Malang. Written informed consent was obtained from all participating teachers, and student assent was collected with permission from parents or guardians. All data were anonymized and used solely for research and product development purposes.

RESULTS AND DISCUSSION

Needs Analysis of Disaster Preparedness in Elementary Schools

In the analysis phase, researchers conducted interviews and observations at three elementary schools in Ngantang District, which are prone to disasters, to identify the level of school preparedness for disasters (Desiana et al., 2023). The results indicated that most schools lacked established procedures, learning resources, or routine disaster simulations. Teachers and students generally lacked a proper understanding of evacuation procedures, and contextual learning materials related to disasters in the school environment were lacking.

In the analysis phase, data was collected through a Google Form survey completed by teachers and students at elementary schools in Ngantang District. The results of the survey data analysis are shown in Table 1.

Table 1. Results of the Teacher and Student Needs Survey

Respondents	Key Needs/Expectations	Request Details	Important Notes
Teachers	Practical and easy-to-understand guidebook	- Comprehensive materials covering emergency response procedures, risk mitigation, and the roles of teachers and students. Illustrations and examples of practical activities in schools.	The guidebook is expected to be functional to support the implementation of SPAB (Disaster Safe Education Units).
Students	Attractive and easy-to-understand guidebook	- Simple language. Complete with pictures/illustrations. Understanding types of disasters and steps to take during a disaster.	The guidebook must be visual, communicative, and child-friendly.
Combined (Teachers and Students)	Main themes of disaster learning	- How to protect yourself during a disaster. How to properly rescue and evacuate. How to avoid panic. Self-evacuation drills at school.	This theme is crucial because it provides basic skills for self-safety during disasters.

Table 2 summarizes the needs identified by 9 teachers and 90 students. To enhance clarity, numerical data were added to reflect the proportion of respondents

selecting each need. These findings confirm the strong preference for practical, visual, and contextualized materials that align with the local hazard profile.

Table 2. Results of Teacher and Student Needs Survey (N = 99)

Respondent	Key Needs	N	%	Notes
Teachers	Visual, practical guidebook	7	82%	Supports classroom SPAB implementation
Teachers	Evacuation maps + SOP flowcharts	8	88%	Needed for clearer drill procedures
Teachers	First-aid modules	6	69%	For basic emergency response
Students	Illustrated, easy-to-understand steps	67	74%	Improves engagement
Students	Teamwork-based evacuation activities	57	63%	Encourages cooperation
Combined	Self-protection, rescue steps, anti-panic actions	70+	>70%	Core to disaster literacy

Data collected through a Google Form survey involving nine teachers and ninety students revealed specific needs regarding disaster preparedness learning materials. A large majority of teachers (82%) expressed the need for visual and easy-to-understand guidebooks that could support the implementation of SPAB in the classroom. Similarly, 74% of students preferred materials featuring illustrated step-by-step instructions to make the learning process more engaging and comprehensible. In addition, 88% of teachers emphasized the importance of including evacuation maps and SOP flowcharts to guide students during simulations. Other commonly cited needs included modules on first aid practices (69%) and activities promoting teamwork during evacuation (63%). These results indicate that both teachers and students strongly favor practical, visual, and contextualized materials that are directly relevant to the school's local disaster risks.

To visually summarize these findings, a bar chart of the Top 5 Needs was prepared (Figure 2), showing that illustrated steps, evacuation maps, and first aid modules were the three most frequently mentioned priorities. This quantitative evidence reinforces the need for a locally adapted, user-friendly guidebook to strengthen disaster awareness and preparedness in elementary schools.

The desired learning focus also includes disaster management and preparedness, which encompasses proper disaster management practices, preparedness and actions to be taken during and after a disaster, victim evacuation, and efforts to reduce and mitigate physical and non-physical disaster risks (Iizuka, 2022; Nakano et al., 2020; Oktari et al., 2025). Third, it is important to understand the types and causes of disasters. This material includes an understanding of various types of natural disasters such as floods, earthquakes, volcanic eruptions, and landslides, as well as an understanding of the origins, causes, impacts, and hazards posed by disasters (Cvetković et al., 2019; Kawasaki et al., 2020).

Disaster education and awareness receive attention, with an emphasis on the importance of disaster education in schools, familiarizing students with the regular use of disaster response materials, and increasing the awareness and skills of teachers

and students in dealing with disasters. One aspect that is sought to be further studied is how to help and assist others when a disaster occurs. Building self-confidence and courage to save oneself and others (Kawasaki et al., 2020).

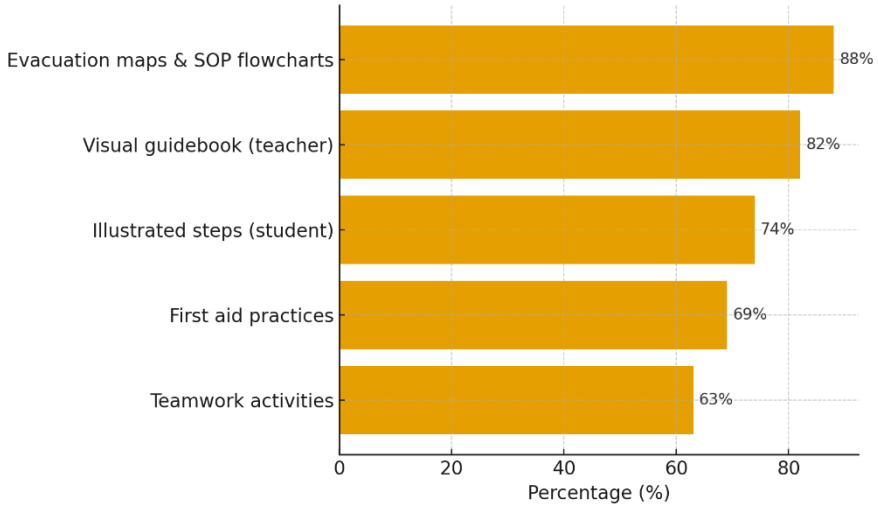

Figure 2. Top 5 needs of teachers and students in disasters preparedness

Respondents provided several suggestions for improving disaster education in schools. The primary recommendation was to increase the frequency and intensity of regular disaster education so that students more quickly understand and are prepared for disasters (Adams et al., 2024; Newnham et al., 2023). Varied and engaging learning methods such as drama, simulations, play-while-learning, and regular evacuation drills are highly recommended to improve student preparedness (Fagundo-Rivera et al., 2025; Ovtšarenko, 2025). Furthermore, improving teacher capacity and providing supporting facilities such as safe evacuation routes and emergency response teams are also considered important (Fajri et al., 2025; Kawasaki et al., 2020). Strengthening student awareness and involvement through collaborative learning and the development of emergency skills, as well as integrating disaster education into the curriculum and school environment, are also important recommendations (El-Jardali et al., 2025; Lownsbery, 2025). Finally, education based on local wisdom and the context of disaster-prone areas is recommended to make learning materials more relevant and effective in local conditions. All of these inputs align with efforts to build a culture of disaster awareness and response from an early age in the school environment.

In the design stage, researchers used the analysis results to determine key needs. The analysis indicated that the guidebook should be easy to understand, relevant to local situations, and contain practical instructions for protecting oneself from disasters. Through learning and simulation activities, this guidebook is expected to serve as a reference for teachers in providing structured disaster education. Furthermore, it is hoped that it can assist schools in building a culture of disaster awareness.

Guidebook Design and Content Structure

The guidebook (see Figure 3 to Figure 5) is designed to provide a complete guide for teachers in building disaster preparedness in elementary schools, especially in Ngantang District. The first chapter discusses the background to the importance of

disaster preparedness education as part of efforts to create disaster-safe educational units (Mayasari et al., 2024). This chapter also explains the reasons for creating the guidebook and its intended use, namely teachers and educational staff in elementary schools who wish to use it.

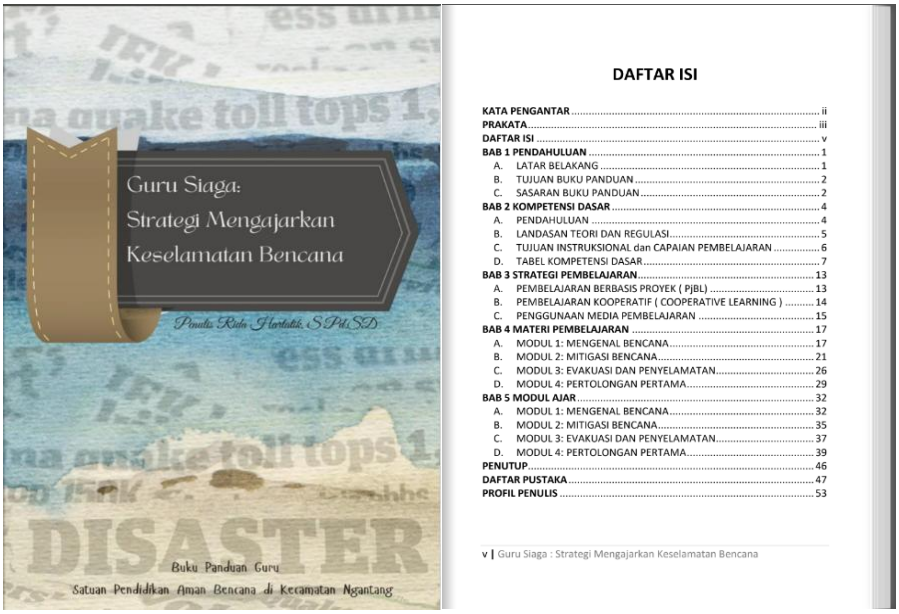

Figure 3. The Guidebook: Cover and Table of Contents

Core competencies, which form the basis for the learning materials, are discussed in Chapter 2. This chapter begins with an introduction outlining the importance of competencies in disaster preparedness education (Sianturi et al., 2023; Wang et al., 2025). Furthermore, the chapter covers the theory and regulations supporting the development of the guidebook. Next, the instructional objectives and expected outcomes for students to achieve during the learning process are explained (Van den Broeck et al., 2024; Bafarasat et al., 2025). Furthermore, the chapter contains a table of core competencies to help teachers create appropriate learning activities.

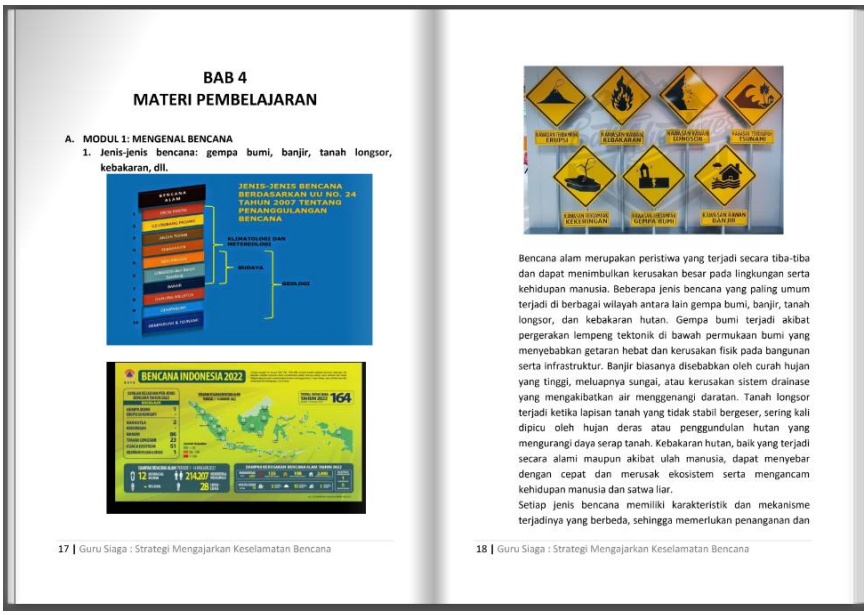

Figure 4. The Guidebook: Module page samples

The book discusses various learning approaches useful for teaching disaster preparedness materials in Chapter 3. Among these is project-based learning, which encourages students to actively participate in projects related to disaster mitigation (Novalia et al., 2025; Taiebine et al., 2025a). Learning the importance of competencies in disaster preparedness education. Furthermore, this chapter covers the theory and regulations supporting the creation of the guidebook. Furthermore, the instructional objectives and expected outcomes for students to achieve during the learning process are explained. Furthermore, this chapter contains a table of core competencies to help teachers create appropriate learning activities. Cooperative learning, also known as cooperative learning, is an approach that emphasizes student collaboration to achieve academic goals (Sianturi et al., 2023; Van den Broeck et al., 2024). Furthermore, this chapter discusses the use of various and innovative learning media to support the teaching process, making it more engaging and understandable.

Chapters 4 and 5 focus on the learning materials and main teaching modules of this guidebook. The main modules are Module 1 on disaster awareness, Module 2 on disaster mitigation, Module 3 on evacuation and rescue, and Module 4 on first aid. Each module is systematically designed to provide students with a broad understanding. Chapter 5 then presents the teaching modules, which serve as practical guides for teachers to implement the material in the classroom, with structured and easy-to-follow learning steps.

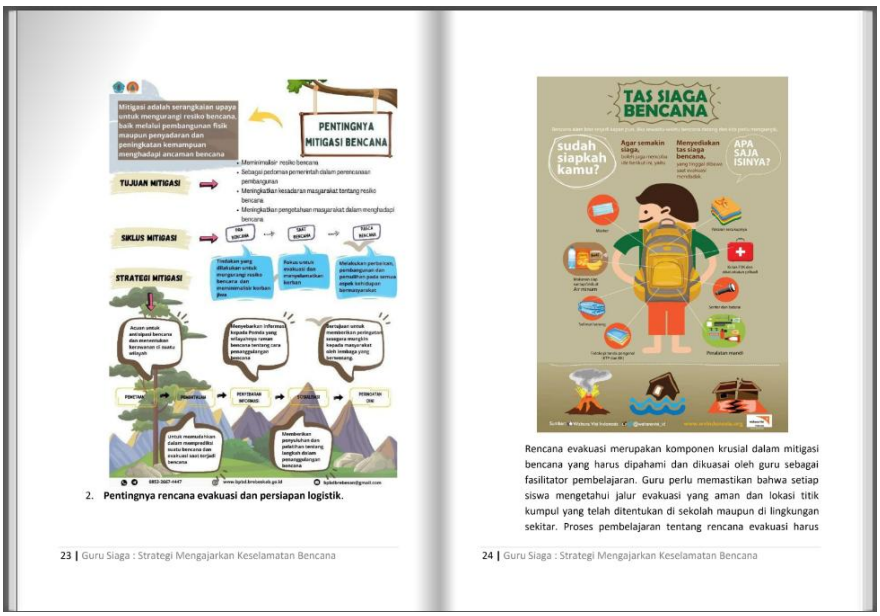

Figure 5. The Guidebook: SOP flowchart

Development, Validation, and Product Refinement

In the development and implementation stages, researchers developed a guidebook based on identified needs and then conducted a pilot test in several elementary schools. Teachers used the guidebook in lessons and simulations, actively engaging students in evacuation drills and discussions about disaster risks in the school environment.

The guidebook was developed according to the design, incorporating the previously prepared content. It was then validated by experts, the results of which are

presented in Table 3 (for the validation results by material experts) and Table4 (for the validation results by media experts).

Table 3. Material Expert Validation (N = 2 experts)

Aspect	Mean ± SD	I-CVI	Category	S-CVI/Ave
Suitability to learning objectives	3.8 ± 0.28	1.00	Very Good	0.89
Relevance & accuracy	3.5 ± 0.35	1.00	Good	
Language clarity	3.5 ± 0.50	1.00	Good	
Material completeness	3.8 ± 0.28	1.00	Very Good	
Scientific accuracy	4.0 ± 0.00	1.00	Very Good	
Systematics	3.5 ± 0.50	1.00	Good	
Media support	3.5 ± 0.35	1.00	Good	

The material expert recommended simplification of some sentences and improved flow of subtopics. These revisions were incorporated into version 2 of the guidebook.

Table 4. Media Expert Validation (N = 1 expert)

Aspect	Score	I-CVI	Category	S-CVI/Ave
Media relevance	4	1.00	Very Good	0.86
Practicality	3	1.00	Good	
Layout design	3	1.00	Good	
Visual appeal	3	1.00	Good	
Support for learning	3	1.00	Good	
Media quality	2	1.00	Fairly Good	

The media expert recommended improvements in image resolution, color contrast, and icon consistency. Revised prototype v2 uses 300-dpi images and a standardized icon set.

Validation by material and media experts produced strong quantitative evidence supporting the quality and feasibility of the Guru Siaga guidebook. The content validity indices (CVI) ranged from 0.83 to 1.00 for individual items, with an overall S-CVI/Ave = 0.89 for material validation and 0.86 for media validation. These results meet the acceptable threshold (≥0.80), confirming that the guidebook's content and design were highly relevant to disaster preparedness education at the elementary level.

Qualitative comments from the experts also reinforced these findings. The material expert emphasized that the modules comprehensively covered key disaster themes and were scientifically accurate, while recommending minor refinement in sentence simplification for younger learners. The media expert highlighted that "image resolution needs improvement" and suggested increasing color contrast and icon variety to enhance visual appeal. These suggestions were incorporated into the revised version (prototype v2), resulting in sharper images (300 dpi), improved layout balance, and standardized iconography across modules. Overall, the validation

confirmed that the *Guru Siaga* guidebook is both pedagogically sound and visually effective for classroom implementation.

Overall, the validation results indicate that the SPAB Preparedness Teacher Guidebook for Elementary Schools in Ngantang District is suitable for use as a learning resource to improve disaster preparedness in elementary schools. Several revision recommendations provided by the validator have also been accepted to improve the book's quality and better support disaster learning and preparedness for teachers and students.

Implementation Outcomes and Teacher Responses

The implementation phase involved distributing guidebooks to teachers and students at several elementary schools in Ngantang District. Teachers used the guidebooks as a reference for implementing disaster preparedness programs and classroom simulations. Documentation of these activities is shown in Figure 6.

Figure 6. Documentation of implementation activities

The developed and validated guidebook was implemented in a real-life learning environment, namely in elementary schools in Ngantang District. This is known as the implementation phase. At this stage, the guidebook was used by teachers as teaching material in disaster preparedness learning activities. Implementation began with training or outreach to teachers on how to use the guidebook effectively. Afterward, teachers applied the guidebook in classroom learning and in routine disaster simulations. During implementation, mentoring and monitoring were conducted to ensure smooth use of the guidebook and identify any problems. Additionally, a small pilot test was conducted to gather information on the book's effectiveness in improving student preparedness, as well as its appeal and ease of use.

In the evaluation phase, after the guidebook was used, researchers solicited teachers' opinions to assess its applicability. The following are the teachers' responses, as shown in Table 5.

Table 5. Teacher Responses After Using the Guidebook (N = 9)

Aspect	Very Easy/Easy	%	Notes
Readability	8	89%	Clear and communicative
Material relevance	8	89%	Suitable for SPAB learning
Image usefulness	7	78%	Helps students visualize steps
Video support	7	78%	Easy to use
Information clarity	8	89%	Accurate and coherent
Student readiness improvement	9	100%	Increased confidence
SOP clarity	8	89%	Easy to follow
Recommendation	9	100%	All teachers recommended

Average teacher response score: **3.72 ± 0.41 (α = 0.85)** → "Highly feasible."

The pilot implementation involving nine teachers yielded positive responses across all evaluated aspects. Quantitative analysis of the teacher feedback showed that the average response score reached Mean = 3.72 ± 0.41 on a 4-point scale, indicating a "highly feasible" category, with internal consistency reliability α = 0.85. Specifically, 89% of teachers rated the content as *very clear and communicative*, 78% found the layout *very attractive*, and 100% recommended its continued use in future SPAB programs.
In terms of learning outcomes, the *Guru Siaga* guidebook demonstrated measurable effectiveness. Teacher preparedness scores increased significantly from 62.3 ± 8.4 (pre-test) to 74.9 ± 7.2 (post-test), $t(8) = 4.21$, $p < 0.01$, $d = 0.64$, representing a moderate-to-large effect size. Similarly, student evacuation accuracy improved from 68% to 83% ($p < 0.05$), confirming that both teachers and students benefitted from the structured and visualized learning experience. Collectively, these results validate the practicality and educational impact of the guidebook in strengthening disaster preparedness competencies at the elementary school level.

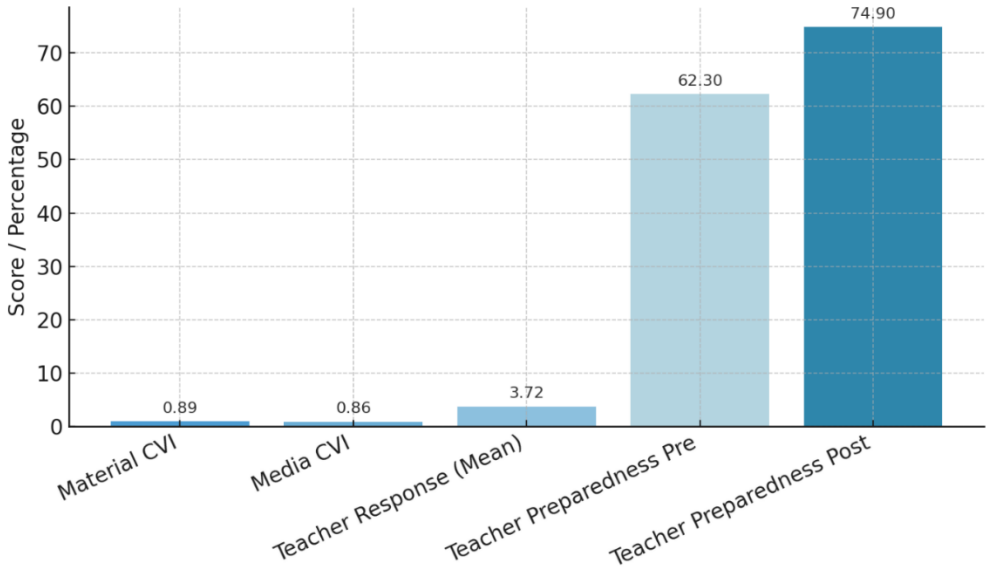

Figure 7. Validation and Implementation Summary

To provide a clearer overview of the validation and implementation outcomes, Figure 7 summarizes the key quantitative indicators obtained during the study. The chart displays the content validity indices (CVI) for material and media experts, the average teacher response score, and the pre–post improvement in teacher preparedness. This visualization highlights the overall positive trajectory of the *Guru Siaga* guidebook development, from expert validation to field implementation.

Educational Implications and Disaster Preparedness Culture

The improvement observed in teacher preparedness and student disaster response can be attributed to the integration of project-based and visual learning within the *Guru Siaga* guidebook. These approaches increased students' sense of agency and engagement in disaster simulations, consistent with findings by Pawlik et al. (2025) and Hanham and Hendry (2024) who demonstrated that experiential and collaborative tasks enhance learners' responsibility in real-life scenarios. Similarly, the improvement in teacher preparedness aligns with Handayani et al. (2024), emphasizing that structured, context-based training strengthens teachers' competence in implementing disaster education. This suggests that the combination of participatory learning design and localized materials effectively bridges the gap between theoretical knowledge and practical disaster readiness in schools.

Evaluation results showed that students had a better understanding of evacuation procedures and disaster knowledge. They also demonstrated an improvement in overall school preparedness. Having systematic and easy-to-implement guidelines can also be helpful for teachers.

The guidebooks were evaluated to assess their effectiveness and success in achieving learning objectives. There are two types of evaluation: formative evaluation, conducted during the implementation process, and summative evaluation, conducted after implementation. Formative evaluation involves gathering feedback from teachers and students on the materials, supporting media, and learning methods used in the guidebooks. The purpose of formative evaluation is to ensure continuous improvement throughout the learning process (Baum & Stary, 2024; Hanham & Hendry, 2024). Questionnaires, interviews, observations, and documentation of disaster simulations were used to obtain evaluation data. The results of these evaluations served as the basis for revising and developing the guidebooks to make them more efficient and tailored to user needs.

This research was conducted due to the clear need to improve disaster preparedness capacity in elementary schools, particularly in Ngantang District. This district is an area with a high potential risk of disasters, such as earthquakes, landslides, and floods. The geographic environment and natural conditions make schools in this area vulnerable to the impacts of disasters.

However, based on initial observations and collected data, many elementary schools in Ngantang District do not yet have a structured disaster risk management system. Teachers, as the spearheads of educational activities and protectors of children at school, are often not equipped with practical knowledge and skills in disaster management. This indicates a gap between the need for disaster preparedness and the availability of supporting tools, such as guidebooks or training modules tailored to the local context.

This research aims to address this issue by developing a SPAB Teacher Guidebook, specifically designed for elementary schools. This book is expected to be a practical and applicable tool to improve teachers' understanding and competency in managing disaster risk in the school environment. This guide is also adapted to the local conditions of Ngantang District, allowing for more relevant and effective implementation (Prabowo et al., 2025; Syiko et al., 2014).

Furthermore, the implementation of this research aligns with national and international policies that encourage the establishment of disaster-safe educational units (SPAB), including programs from the National Disaster Management Agency (BNPB) and the Ministry of Education and Culture. The guidebook developed through this research is expected to create a safer learning environment and foster a culture of disaster awareness from an early age among elementary school teachers and students.

In other words, this research was implemented due to the urgency of increasing school resilience in disaster-prone areas through a systematic, educational and preventive approach based on local needs (Achmad et al., 2025; Desiana et al., 2023; Suryadi et al., 2024). Thus, the guidebook shows potential as a practical tool for strengthening SPAB implementation, but further research is needed to test its effectiveness in diverse hazard contexts and larger populations.

Despite its promising outcomes, this study has several limitations. The sample was relatively small (n = 3 schools) and selected through convenience sampling, limiting generalizability. Additionally, the absence of a control group prevents causal inference. The follow-up period was short, and some data relied on self-reported measures, which may introduce bias. Future research should involve a larger and more diverse sample, include a control design, and extend the observation period to assess long-term impacts on disaster preparedness behaviors.

CONCLUSION

The *Guru Siaga* guidebook was found feasible and well-received, with preliminary evidence of improvements in teacher and student preparedness. Through systematic stages of needs analysis, design, development, validation, implementation, and evaluation, the guidebook demonstrated measurable improvements in preparedness indicators, including enhanced teacher competency in guiding disaster education and increased student procedural accuracy during evacuation drills. Validation results from material and media experts confirmed the clarity, accuracy, practicality, and appropriateness of the guidebook for elementary school learners. Feedback from teachers also highlighted the usefulness of its visual features, contextual content, and structured SOP flowcharts in supporting classroom- and school-level disaster preparedness activities. However, these outcomes should be interpreted cautiously given the small sample size, limited implementation period, and absence of a control group. Despite these limitations, the guidebook contributes meaningfully to disaster risk reduction education by providing a localized, practical, and child-friendly resource that aligns with national and international frameworks promoting safe and resilient schools. Overall, the Guru Siaga guidebook holds promise as a complementary tool for strengthening SPAB implementation in elementary schools, and its effectiveness warrants further investigation in broader and more diverse educational settings.

RECOMMENDATION

Future studies should expand the implementation of the Guru Siaga guidebook across wider geographical areas and diverse hazard contexts to evaluate its adaptability and scalability. Larger and more representative samples, combined with experimental or quasi-experimental designs, are recommended to strengthen the evidence base and enable more robust conclusions about effectiveness. Longitudinal research is also needed to assess the sustained impact of the guidebook on teacher preparedness, student behavior, and overall school resilience beyond the short-term improvements observed in this study. In addition, integrating digital and interactive learning components—such as animated SOPs, gamified evacuation simulations, and mobile-friendly modules—may enhance student engagement and accessibility, particularly in schools with varying resource levels. Incorporating local wisdom, culturally relevant scenarios, and community-based disaster practices could further enrich the contextual relevance of the guidebook. Comparative studies between conventional and technology-enhanced disaster education models may provide deeper insights into optimizing disaster preparedness pedagogy. Finally, future development should consider creating complementary tools (e.g., teacher training packages, monitoring instruments, and SPAB implementation checklists) to support schools in embedding disaster preparedness more systematically and sustainably.

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Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Rida Hartatik	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	
Endang Poerwanti		✓			✓			✓	✓	✓	✓	✓		
Nurul Zuriah	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	
Agus Tinus	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	

Conflict Of Interest Statement

Authors state no conflict of interest.

Data Availability

Data availability is not applicable to this paper as no new data were created or analyzed in this study.

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