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Improving Disaster Mitigation Awareness through Discovery Learning in *Madrasah Ibtidaiyah* Students

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Abstract: This study aims to analyze the role of the discovery learning model in increasing disaster mitigation awareness among MI/SD students. It employed a qualitative approach using the Systematic Literature Review (SLR) method following the PRISMA 2020 guidelines. A literature search was conducted across five databases (Google Scholar, ERIC, ScienceDirect, Garuda, and DOAJ) for publications between 2020 and 2025. Of the 487 records identified, after duplicate removal, title-and-abstract screening, and full-text eligibility assessment based on inclusion and exclusion criteria, 20 articles were obtained as the final sample and analyzed using thematic analysis. The results show that integrating disaster mitigation education into learning can improve students' knowledge, awareness, and preparedness for potential disasters. The application of discovery learning encourages active student involvement through exploration, observation, and drawing conclusions, while also developing critical thinking and problem-solving skills. In addition, the use of learning media such as videos, interactive worksheets, and digital teaching materials supports more contextual and meaningful learning. These findings provide a conceptual basis for developing discovery learning-based disaster mitigation learning at the elementary school level.

Keywords: Disaster Mitigation; Discovery Learning; MI Students; SLR.

Abstrak: Penelitian ini bertujuan menganalisis peran model *discovery learning* dalam meningkatkan kesadaran mitigasi bencana pada siswa MI. Penelitian menggunakan pendekatan kualitatif dengan metode *Systematic Literature Review* (SLR) yang mengikuti panduan PRISMA 2020. Penelusuran literatur dilakukan pada lima basis data (Google Scholar, ERIC, ScienceDirect, Garuda, dan DOAJ) untuk publikasi rentang tahun 2020–2025. Dari 487 artikel yang teridentifikasi, setelah penghapusan duplikat, penyaringan judul dan abstrak, serta telaah teks penuh berdasarkan kriteria inklusi dan eksklusi, diperoleh 20 artikel sebagai sampel akhir yang dianalisis menggunakan teknik analisis tematik. Hasil kajian menunjukkan bahwa integrasi pendidikan mitigasi bencana dalam pembelajaran dapat meningkatkan pengetahuan, kesadaran, dan kesiapsiagaan siswa terhadap potensi bencana. Penerapan *discovery learning* mendorong keterlibatan aktif siswa melalui kegiatan eksplorasi, pengamatan, dan penarikan kesimpulan, sekaligus mengembangkan keterampilan berpikir kritis dan pemecahan masalah. Selain itu, penggunaan media pembelajaran seperti video, LKPD interaktif, dan bahan ajar digital mendukung pembelajaran yang lebih kontekstual dan bermakna. Temuan ini memberikan dasar konseptual bagi pengembangan pembelajaran mitigasi bencana berbasis *discovery learning* di tingkat sekolah dasar.

Kata Kunci: Mitigasi Bencana; Pembelajaran Berbasis Penemuan; Siswa MI; SLR.

INTRODUCTION

Indonesia is one of the countries with the highest disaster vulnerability in the world. Indonesia's geographical location at the meeting point of three major tectonic plates and within the Pacific Ring of Fire makes this region prone to earthquakes,

volcanic eruptions, and tsunamis (Baldah et al., 2023). Hydrometeorological factors such as high rainfall and climate change contribute to an increased potential for flooding and landslides in various regions. Data released by the National Disaster Management Agency shows that disasters occur repeatedly every year with a significant impact on the lives of communities, including school-age children. This situation indicates that disaster management efforts should not be limited to emergency response and rehabilitation (Suleman, 2024), but must be reinforced through systematic and sustainable mitigation strategies, one of which is through education.

Education plays a strategic role in building a culture of disaster awareness from an early age (Hardiawan & Mahardhani, 2022). At the primary education level, including *Madrasah Ibtidaiyah* (MI), students are in the concrete operational cognitive development phase, which allows them to understand concepts through direct experience and contextual learning. Instilling disaster mitigation awareness at this stage is important because it will shape their mindset, attitudes, and habits that will remain with them into adulthood. Disaster mitigation awareness is not only related to knowledge about the types of disasters, but also includes understanding risks, the ability to recognize danger signs, and the readiness to take appropriate action when a disaster occurs. Thus, disaster mitigation education in MI must be designed in a structured manner in order to foster understanding and shape attitudes of preparedness.

The reality of learning in elementary schools shows that disaster management material is often delivered theoretically and with a focus on memorization. Students tend to learn terms such as earthquake, flood, or volcanic eruption without understanding the concrete steps they should take to protect themselves. Teacher-centered learning with minimal student involvement causes disaster mitigation material to be meaningless and fails to foster deep awareness. In fact, disaster mitigation education requires the internalization of values and practical skills, not just cognitive mastery of concepts. Therefore, innovative learning models are needed that encourage students to actively engage in the process of discovering and understanding mitigation concepts independently.

One learning model that is relevant to addressing these needs is discovery learning. This model is rooted in constructivist theory, which emphasizes that knowledge is constructed by students themselves through a process of exploration, observation, data collection, and drawing conclusions. In discovery learning, teachers act as facilitators who guide students through the stages of stimulation, problem identification, data collection, data processing, verification, and generalization (Raharjo & Muljani, 2022). This process enables students to not only passively receive information, but also actively seek, process, and deeply understand concepts. These characteristics are in line with the objectives of disaster mitigation education, which requires contextual understanding and critical thinking skills in dealing with emergency situations.

Various literature studies show that discovery learning is effective in improving learning outcomes, conceptual understanding, and critical thinking skills of elementary school students (Jannah et al., 2025). This model has also been proven to increase student engagement in the learning process, making learning more meaningful. In the context of disaster education, experience-based and participatory learning approaches are considered more effective in building preparedness than

conventional lecture methods. However, based on a review of the literature, studies that specifically integrate discovery learning in an effort to increase disaster mitigation awareness among MI students are still relatively limited. Most studies have focused more on improving cognitive learning outcomes, while aspects of awareness and preparedness have not been analyzed in depth through a conceptual approach.

This model has also been proven to increase student engagement in the learning process, making learning more meaningful. In the context of disaster education, experience-based and participatory learning approaches are considered more effective in building preparedness than conventional lecture methods. However, based on a review of the literature, studies that specifically integrate discovery learning in an effort to increase disaster mitigation awareness among MI students are still relatively limited. Most studies have focused more on improving cognitive learning outcomes, while aspects of awareness and preparedness have not been analyzed in depth through a conceptual approach.

Disaster mitigation awareness encompasses three main dimensions, namely knowledge about disaster risks, an attitude of vigilance and concern for the environment, and basic skills in performing self-rescue actions. These three dimensions can be developed through a learning process that encourages students to actively observe phenomena, discuss issues, and draw conclusions based on their learning experiences. In this context, discovery learning provides space for students to understand the causes and effects of a disaster, identify preventive measures, and reflect on the importance of preparedness. Thus, this model contributes not only to students' cognitive aspects, but also to their affective and psychomotor aspects.

The ideal condition is the realization of disaster mitigation learning in *Madrasah Ibtidaiyah* that is integrated into thematic learning, contextual, and capable of fostering awareness and responsiveness to disaster risks. Students are expected not only to know the definitions and types of disasters, but also to understand simple mitigation measures that can be taken at school and at home. In addition, learning is expected to instill values of responsibility, concern, and cooperation in dealing with emergency situations. Through a comprehensive synthesis of literature, this study seeks to formulate a theoretical basis that can be used as a reference for educators in implementing discovery learning to increase disaster mitigation awareness among MI students.

Based on this background, this study is specifically aimed at three operational objectives. First, to identify and describe how the discovery learning model is implemented in disaster mitigation learning at the MI/SD level, including its learning syntax, the supporting media used, and its integration across subjects. Second, to analyze the extent to which discovery learning is effective in improving the three dimensions of students' disaster mitigation awareness, namely knowledge of disaster risks, an attitude of vigilance, and basic self-rescue skills. Third, to synthesize the factors that influence the success of its implementation as a basis for formulating a conceptual framework of disaster mitigation learning in elementary schools. These three objectives are measured through a Systematic Literature Review of relevant articles published between 2020 and 2025, which are analyzed using thematic analysis to identify recurring patterns, the effectiveness of the model, and existing research gaps.

RESEARCH METHOD

This research used a qualitative approach with the type of research known as a Systematic Literature Review (SLR). This approach was chosen to examine, analyze, and synthesize various relevant research findings regarding the implementation of the discovery learning model in improving disaster mitigation awareness among MI/SD students in a systematic and structured manner. Through this method, the researcher attempted to identify patterns of findings, the effectiveness of the implementation of the learning model, and research gaps that could still be developed.

To ensure transparency and replicability, this review was conducted by following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines (Page et al., 2021) and the systematic review procedures commonly applied in educational research (Kitchenham, 2019). Accordingly, the review was guided by three research questions (RQ): RQ1) How is the discovery learning model implemented in disaster mitigation learning at the MI/SD level? RQ2) To what extent is discovery learning effective in improving students' disaster mitigation awareness? and RQ3) What factors influence the success of its implementation? These three research questions became the basis for formulating the search strategy, the inclusion and exclusion criteria, and the thematic analysis.

The research process began with the formulation of research questions focusing on how discovery learning was implemented in disaster mitigation learning in MI/SD, to what extent it was effective in improving disaster mitigation awareness, and what factors influenced its success. The literature search strategy was conducted through various scientific databases such as Google Scholar, ERIC, ScienceDirect, Garuda, and DOAJ using relevant keywords, including "discovery learning," "disaster mitigation," "disaster mitigation awareness," and "elementary school." The selected literature was limited to scientific journal articles, proceedings, and relevant studies published between 2020–2025 and available in full text.

Article selection was carried out through several stages, namely identification, screening based on titles and abstracts, and full-text review according to inclusion and exclusion criteria. The inclusion criteria included studies discussing the implementation of discovery learning at the MI level, research related to disaster mitigation education, and articles published in reputable journals or those that had undergone a peer-review process. Articles that were not relevant to the research focus, consisted of non-empirical opinions, or did not have clear methodological explanations were excluded from the analysis. The literature selection process was documented systematically to ensure research transparency.

The selection process was carried out in four stages following the PRISMA flow, namely identification, screening, eligibility, and inclusion, as presented in Figure 1. At the identification stage, a total of 487 records were obtained from the five databases (Google Scholar = 215; Garuda = 98; DOAJ = 76; ScienceDirect = 62; ERIC = 36). After 71 duplicate records were removed, 416 records proceeded to the screening of titles and abstracts, of which 342 records were excluded because they did not match the research focus. A total of 74 reports were then assessed for eligibility through a full-text review. At this stage, 54 reports were excluded for the following reasons: the study did not focus on the MI/SD level (n = 18), it was not related to disaster mitigation education (n = 14), it was a non-empirical opinion or

had no clear methodological explanation (n = 12), and the full text was not available (n = 10). Based on this process, 20 articles met all of the inclusion criteria and were determined as the final sample analyzed in this study (see Figure 1).

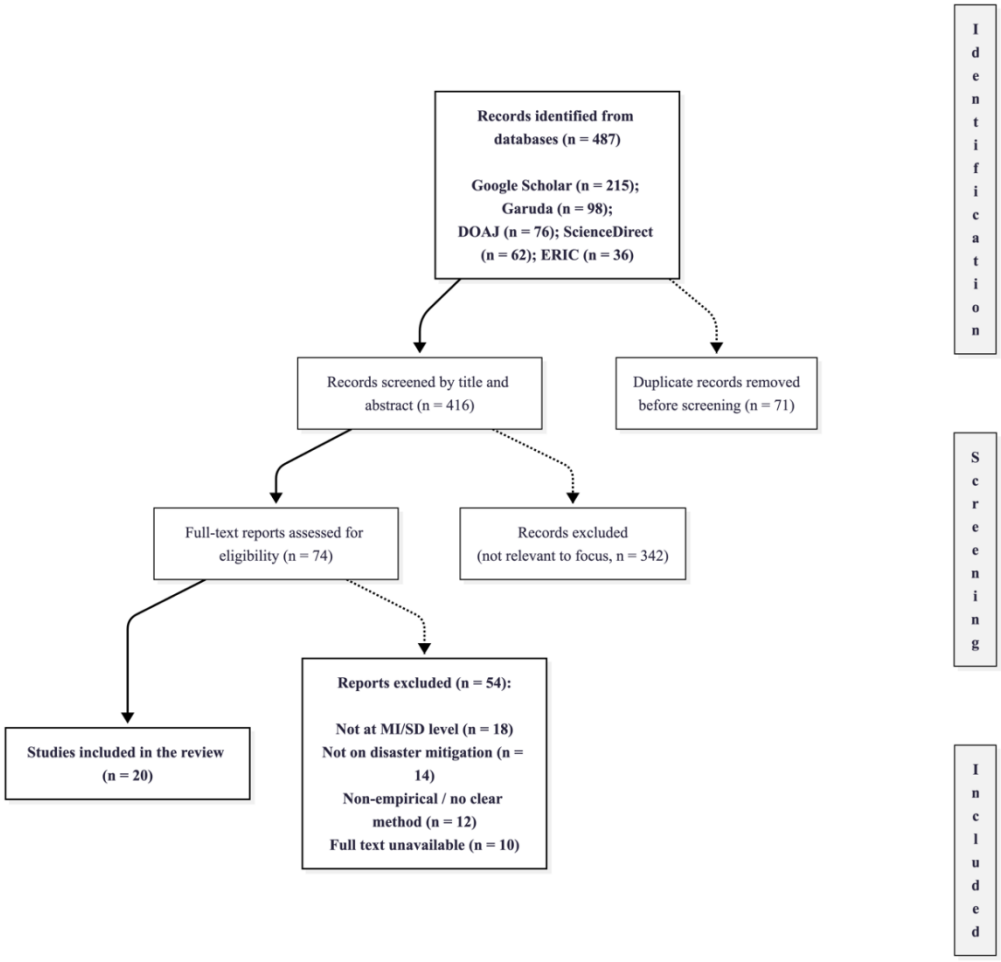

Figure 1. PRISMA 2020 flow diagram of the article selection process

The data collection technique was conducted through a documentation study by extracting important information from each selected article, including the author's name, year of publication, research objectives, methods used, research subjects, and main findings. The collected data were then analyzed using thematic analysis techniques by thoroughly reading all articles, coding relevant information, grouping the codes into major themes, and developing a narrative synthesis that described the patterns of research findings.

Data validity was maintained through source triangulation by comparing results across studies to ensure the consistency and credibility of the findings. In addition, an audit trail was conducted by documenting the entire process of literature searching and selection so that it could be traced again. Discussions with colleagues were also conducted to minimize subjective bias in the analysis process.

The results of the review were presented in the form of a systematic narrative description according to the themes obtained and were supported by a literature matrix table summarizing the characteristics and main findings of each study. Through this procedure, the research was expected to provide a comprehensive

overview of the effectiveness of discovery learning in improving disaster mitigation awareness among MI/SD students and to provide a conceptual basis for the development of learning in elementary schools.

RESULT AND DISCUSSION

The 20 articles that met the inclusion criteria were the final result of a selection process that began with 487 records (see Figure 1). Before these studies are presented in the literature matrix, it is necessary to provide an interpretation of their general characteristics in order to understand the basis on which the thematic synthesis was built.

In terms of the year of publication, the 20 studies were distributed across the 2020–2025 period with a clear upward trend toward the most recent years: 2 articles (2020), 1 article (2021), 2 articles (2022), 3 articles (2023), 4 articles (2024), and 8 articles (2025). This pattern indicates that the integration of disaster mitigation and the discovery learning model in elementary education is a growing research interest rather than a settled topic, which at once confirms the timeliness of this review and reinforces the research gap identified in the introduction.

In terms of methodology, the sample was dominated by Research and Development (R&D) studies (7 articles), followed by qualitative and review-based designs such as literature reviews, systematic reviews, and meta-synthesis (6 articles), quantitative and (quasi-)experimental designs (4 articles), Classroom Action Research (2 articles), and mixed-methods research (1 article). This composition is interpretively important: the field is still dominated by the development of learning products and media, while rigorous testing of effectiveness on disaster mitigation awareness is comparatively limited. In other words, the existing literature is stronger in answering "what can be developed" than "how effective it is," which becomes one of the gaps this study highlights.

Thematically, the focus of the 20 studies tends to cluster around three areas, namely the development of disaster mitigation media and teaching materials, the application of the discovery learning model, and the integration of disaster mitigation education into the curriculum, with several studies also emphasizing local wisdom and student preparedness. This distribution of characteristics is what is detailed in the literature matrix below and serves as the empirical basis for the five thematic categories discussed in the following sub-sections.

Table 1. Matrix of the 20 reviewed articles included in the analysis

No	Author	Year	Title	Method	Research Results
1	Baiq Santi	2024	Development of Disaster Mitigation-Based Educational Video Media in Grade V of SDN 15 Salolo, Palopo City (Santi et al., 2024).	Research and Development (R&D)	Based on the analysis results, this study shows that the developed media is feasible and eligible for use as a core video learning medium for disaster mitigation.
2	Titis Wulandari	2023	Literature Review: Analysis of Disaster Mitigation Integration in	Literature Review	Based on the analysis results, this study shows that there are seven articles, both in terms of school levels, that have

No	Author	Year	Title	Method	Research Results
			Learning (Wulandari et al., 2023).		implemented disaster preparedness aimed at applying integrated natural and non-natural disaster mitigation in learning materials using a structured learning model and updates in accordance with the year of journal publication.
3	Ni Putu Mira Adella Rohalina Putri	2025	Interactive Student Worksheets Based on Discovery Learning in Science Subjects for Grade 5 Elementary (Putu et al., 2025).	Research and Development (R&D)	Based on the analysis results, this study shows that the development of interactive Student Worksheets (LKPD) based on Discovery Learning on the subject of Light and Its Properties in fifth grade elementary school is effective in improving students' conceptual understanding and learning motivation, as well as improving the quality of student interaction with the material directly.
4	Uswatun Nikmah	2024	Application of Discovery Learning Method to Improve Student Learning Outcomes in Science Education at MI Tarbiyatul Islamiyah Winong (Nikmah et al., 2024)	Classroom Action Research (PTK)	Based on the analysis results, this study shows that the application of the Discovery Learning method can increase student engagement in learning, motivate students to actively seek information, and develop their critical thinking skills.
5	Rizki Arumning Tyas	2023	Risk Reduction in the Development of Special Pedagogy for Science Subjects to Support Disaster Management in Education: Feasibility and Impact (Tyasa et al., 2023)	Research and Development (R&D)	Based on the analysis results, this study shows that: The feasibility of the Discovery Learning-based LKPD integrated with volcanic eruption disasters that has been developed, according to the assessment of experts and learning practitioners, is in the very good category, and the Discovery Learning-based LKPD integrated with volcanic eruption disasters is effective in improving students' conceptual mastery and preparedness in disaster mitigation.
6	Putu Eka Suarmika	2025	Disaster Risk Reduction Based	Qualitative with meta-	Based on the analysis results, this study shows

No	Author	Year	Title	Method	Research Results
			on Indigenous Science: A Conceptual Model for Integrated Learning in Indonesian Elementary Schools (Suarmika et al., 2025)	synthesis	that: Indigenous peoples have innate cognitive abilities in responding to disasters, and there is a conceptual model of science learning based on local knowledge to train students' responses to disasters. Disaster risk reduction by directly involving vulnerable groups (elementary school students) provides benefits, namely that students will learn about disasters, understand what to do before a disaster occurs, understand the process of saving themselves when a disaster occurs, and be directly involved in emergency response.
7	Rizki Arumning Tyas	2025	Review of Disaster Risk Reduction Education Implementation: Integration, Trends, and Development Directions (Tyasa et al., 2023)	*Systematic Literature Review*	Based on the results of the analysis, this study confirms the importance of integrating DRR into education as a means of building resilient and knowledgeable communities. With continued advances in DRR research and practical application, the education sector has the potential to become a key pillar in global disaster mitigation and preparedness efforts.
8	Widia Mei Linanggita Putri	2020	The Effect of Disaster Puzzle Game Education on Knowledge of Volcanic Disaster Mitigation at Karangsalam Public Elementary School (Putri & Suparti, 2020)	Quantitative	Based on the analysis results, this study indicates that disaster puzzle game education increases knowledge of volcanic disaster mitigation in elementary schools. Disaster education through puzzle games in the form of puzzle-solving challenges provides cognitive and psychomotor stimulation so that children can acquire new knowledge.
9	Rima Tusa'diah.	2020	Development of Learning Tools Based on the Discovery Learning Model	Quantitative Descriptive	Based on the analysis results, this study shows that there is a problem regarding the lack of understanding of natural

No	Author	Year	Title	Method	Research Results
			for Mathematics Materials Oriented Towards Disaster Mitigation (Tusa'diah & Yerizon, 2020)		disaster mitigation among the people of Indonesia, especially children. Therefore, a learning tool based on the discovery learning model oriented towards natural disaster mitigation was created as an alternative solution for introducing disaster mitigation in mathematics learning.
10	Anggit Grahito Wicaksono.	2025	Science Literacy Profiling and Improvement in Disaster Mitigation: The Effectiveness of the Discovery Learning Model for Elementary School Teacher Education Students (Wicaksono et al., 2025).	Mixed-methods with a sequential explanatory approach	Based on the analysis results, this study shows that structured discovery learning significantly improves prospective teachers' science literacy when contextualized in authentic scenarios. This confirms its important role in teacher education in disaster-prone areas such as Indonesia, and recommends the integration of practice-based learning experiences to effectively bridge the gap between theory and practice in science education.
11	Kosim	2022	Effectiveness of Student-Oriented Disaster Mitigation Learning Model on Students' Disaster Awareness in Elementary Schools (Kosim et al., 2022)	Research and Development (R&D)	Based on the analysis results, this study shows that the student-oriented disaster mitigation learning model is effective in increasing students' disaster awareness, which includes knowledge about disasters, signs of impending disasters, the impact of risks and efforts to reduce them, preparedness, and procedures and use of first aid equipment on victims.
12	Syamsu A. Kamaruddin	2024	Disaster Risk Reduction Learning Model in School Curriculum (Kamaruddin, 2024)	Qualitative with a literature review research design (literature research)	Based on the analysis results, this study shows that the learning model successfully instilled a deep understanding of disaster risks and the necessary mitigation measures, making students more sensitive and proactive in dealing with potential threats in their environment. Overall, this

No	Author	Year	Title	Method	Research Results
					study also confirms that the disaster risk reduction learning model contributes significantly to students' preparedness and resilience in facing disasters.
13	Lativa Qurrotaini	2022	Development of Teaching Materials for Digital Pocket Books on Disaster Mitigation in Social Studies Learning in Elementary Schools (Qurrotaini et al., 2022)	Research and Development (R&D)	Based on the analysis results, this study shows that in the expert validation results, the material received a validity score of 92.91% with the criteria of Very Valid, while the media expert assessment results received a score of 92.5% with the criteria of Very Valid. The digital pocket book teaching material on disaster mitigation is valid and can be tested on students and teachers, and the digital pocket book teaching material on disaster mitigation is valid and practical for use in thematic social studies learning.
14	Didik Gunawan, Hadi Soekamto	2023	The effect of video-assisted discovery learning models on students' critical thinking skills (Didik Gunawan et al., 2023)	Posttest-only control group quasi-experiment	Based on the analysis results, this study shows that the video-assisted discovery learning model has a greater influence on students' critical thinking skills. This model also has several other advantages that can support students' critical thinking skills, including increasing activity, encouraging cooperation, communication, and an engaging learning atmosphere. The analysis results also found that gender makes a difference in critical thinking, with female students achieving higher scores than male students.
15	Fitrah Ayu	2021	The Effectiveness of Developing Discovery Learning-Based Physics E-Books on the Theme of Earthquakes to	Research and Development (R&D).	Based on the analysis results, this study confirms that the earthquake-themed Physics e-book is effective in improving students' resilience competencies.

No	Author	Year	Title	Method	Research Results
			Improve Students' Resilience Competence (Ayu & Fauzi, 2021)		
16	Iqbal Nurdin	2025	Development of Web-Based Digital Teaching Materials on Natural Disaster Mitigation (Nurdin et al., 2025)	Research and Development (R&D).	Based on the analysis results, this study shows that: This teaching material is considered suitable for use in learning, according to the assessment given by media experts, who stated that it is "Suitable for use in research," and by subject matter experts, who stated that it is "Suitable for use with improvements." Based on these assessment results, website-based digital teaching materials are suitable for use in the learning process.
17	Khoiri Yahya Afifah	2025	William O. Stanley's Progressive Approach: Active Learning Strategies To Improve Student Learning Outcomes In Disaster Mitigation Materials (Afifah et al., 2025)	Qualitative	Based on the analysis results, this study shows that active learning has been implemented in the Merdeka Curriculum, which adopts the concept of progressivism in its development, making it more relevant. This implementation is also evident in the learning process, teaching methods, and assessment system (evaluation and reflection).
18	Safitri Pramei Hastuti	2024	Local Wisdom in Disaster Mitigation Education: Stilt Houses in Various Regions of Indonesia in Earthquake Disaster Mitigation (Hastuti & Sadeli, 2024)	Qualitative with Library Research	Based on the analysis results, this study shows that disaster education is necessary to provide students with knowledge about local wisdom in their area that has proven to be resilient in the face of disasters. Stilt houses in Indonesia, which have different names, have proven to be resilient in the face of natural disasters such as earthquakes that often hit Indonesia.
19	Zairotul Jannah	2025	Efforts to Improve Students' Problem-Solving Skills with the Discovery Learning Model in	Classroom Action Research (PTK).	Based on the analysis results, this study shows that the Discover Learning model supports the idea that the Discovery Learning learning methodology

No	Author	Year	Title	Method	Research Results
			Global Warming Material (Jannah et al., 2025)		improves students' ability to solve problems related to global warming material.
20	Ifkanaia Zullfriad	2025	The Effect of Experimental Methods on Flood Disaster Mitigation Awareness in Early Childhood (Zullfriadi et al., 2025).	Quantitative with a quasi-experimental design of the Nonequivalent Control Group Design type	Based on the analysis results, this study shows that the experimental method has a significant and more effective influence in improving flood disaster mitigation awareness in children aged 5–6 years. This method provides concrete learning experiences that are in line with the cognitive development characteristics of early childhood.

Sourch: Data Procces (2026)

The results of various studies show that the development of disaster mitigation-based media and teaching materials is considered feasible and effective for use in the learning process at various levels of education. Learning media such as educational videos, digital pocket books, website-based teaching materials, and thematic e-books on disasters have undergone expert validation and are considered highly valid and suitable for use. The use of these media can support a more contextual learning process and help students understand the concept of disaster mitigation more systematically. In addition, the integration of disaster-related material in various subjects shows that disaster mitigation education can be applied flexibly in the curriculum and contribute positively to improving students' knowledge and preparedness.

Various studies also confirm that the application of the Discovery Learning model has a positive impact on the learning process and outcomes of students. This model encourages students to actively seek information, explore, and develop critical thinking and problem-solving skills. The application of Discovery Learning combined with various learning media such as videos, interactive worksheets, and digital teaching materials has been proven to improve conceptual understanding, learning motivation, and student engagement in learning. In addition, this learning model also has a significant effect on improving students' science literacy and critical thinking skills.

The integration of disaster mitigation education into learning has also been proven to increase students' awareness and preparedness for potential disasters. Through various student-oriented learning approaches, students not only gain knowledge about the types of disasters, but also understand the signs of a disaster, its impacts, and the mitigation measures that need to be taken before, during, and after a disaster occurs. In addition, the direct involvement of students in disaster learning activities provides a more meaningful learning experience that can shape a resilient and responsive attitude towards disaster risks in the surrounding environment.

Several studies also show the importance of innovative learning methods and approaches in disaster education, such as the use of educational games, experimental methods, and the integration of local wisdom into learning materials. This approach

is considered capable of providing more optimal cognitive and psychomotor stimulation for students, especially at the primary education level and early childhood. In addition, the integration of disaster risk reduction concepts in education is seen as a strategic step towards building a more resilient and knowledgeable society in facing potential disasters in the future. Overall, these findings confirm that disaster mitigation education integrated into learning plays an important role in improving students' knowledge, skills, and preparedness for disasters.

Discussion

From several articles related to increasing awareness and disaster mitigation in elementary schools, five categories were identified that could be developed.

Trends in Disaster Mitigation Education Research

Based on various studies that have been reviewed, it appears that the trend in disaster mitigation education research shows a shift from a theoretical approach to more contextual, applicable learning that is oriented towards student preparedness. Disaster mitigation learning no longer focuses solely on conveying disaster concepts, but also emphasizes the development of practical skills, responsive attitudes, and decision-making abilities in disaster situations. This is reflected in various studies that emphasize experience-based learning, simulations, and activities that encourage students to actively engage in understanding disaster risks and mitigation efforts from an early age.

Research trends also show an increase in the use of digital technology as a medium and source of learning in disaster mitigation education (Wulandari et al., 2023). Various forms of media such as instructional videos (Santi et al., 2024), digital pocket books, web-based teaching materials, and puzzle-based educational games (Putri & Suparti, 2020) used to increase the appeal and effectiveness of learning. The use of this technology allows for more interactive, visual, and accessible presentation of material to students. Thus, the integration of technology in disaster mitigation learning is an important strategy for improving students' understanding of concepts and preparedness for various potential disasters (Qurrotaini et al., 2022).

The next research trend shows the integration of disaster mitigation material into various subjects at school, such as social studies, mathematics, and thematic learning in elementary schools. This integration is carried out through a contextual approach that links learning material to environmental conditions and potential disasters around students. In addition, various active learning models such as discovery learning (Tusa'diah & Yerizon, 2020), problem based learning (Kosim et al., 2022), experimental method (Zullfriadi et al., 2025)s, as well as a progressive approach (Afifah et al., 2025) It is also widely used to encourage student engagement in the learning process. This approach not only improves academic understanding, but also fosters awareness and disaster literacy among students.

Research trends also show a growing interest in developing learning tools and reinforcing local values in disaster mitigation education. The development of tools such as lesson plans, student worksheets, digital teaching materials, and learning media generally uses a research and development approach (Nurdin et al., 2025) emphasizing aspects of validity, practicality, and effectiveness. In addition, several studies have begun to integrate local wisdom as a source of contextual learning, such as the use of the concept of stilt houses as an earthquake mitigation strategy (Hastuti

& Sadeli, 2024). This shows that disaster mitigation education is not only oriented towards scientific and technological aspects, but also utilizes local cultural values as part of efforts to build community awareness and resilience to disasters.

The Dominance of the Discovery Learning Model

The discovery learning model has become one of the dominant learning approaches in educational research, particularly in science learning and disaster mitigation education. This model is widely used because it emphasizes a student-centered learning process, in which learners are actively involved in the process of discovering concepts through observing, questioning, trying, analyzing, and drawing conclusions. (Putu et al., 2025). The dominance of this model indicates a trend in educational research that focuses on developing critical thinking skills, conceptual understanding, and student independence in learning.

Research trends also show that discovery learning models are often combined with the development of various learning tools and media. Various studies have developed interactive student worksheets, digital teaching materials, e-books, and video-assisted learning media designed in accordance with the syntax of discovery learning. (Nikmah et al., 2024). The integration of digital media aims to increase student engagement in the learning process and facilitate the understanding of abstract concepts. Thus, combining active learning models with educational technology has become an important trend in modern learning research.

Methodologically, studies examining the application of discovery learning are generally dominated by two main approaches, namely the Research and Development (R&D) method and experimental design. The R&D approach is widely used in studies focusing on the development of learning tools such as lesson plans, student worksheets, and digital teaching materials, with stages of validity, practicality, and effectiveness testing. (Tusa'diah & Yerizon, 2020). Meanwhile, experimental or quasi-experimental designs (Didik Gunawan et al., 2023) more commonly used to test the effect of applying the discovery learning model on improving student learning outcomes, critical thinking skills, and science literacy (Wicaksono et al., 2025).

Several studies also show that the application of discovery learning not only focuses on improving academic abilities, but also on strengthening learning contexts that are relevant to real life, such as disaster mitigation education. This model allows students and prospective teachers to understand scientific concepts while developing analytical and decision-making skills in real-life situations.(Ayu & Fauzi, 2021). Thus, the dominance of research on discovery learning shows that this model is considered effective in integrating concept mastery, developing higher-order thinking skills, and shaping students' attitudes and preparedness in facing various contextual problems.

Development of Disaster Mitigation Media and Teaching Materials in the Curriculum

Based on various studies that have been analyzed, it appears that the development of disaster mitigation media and teaching materials in the curriculum shows a growing trend in the world of education. A number of studies have focused on the development of learning products in the form of audiovisual media, digital teaching materials, and learning tools specifically designed to integrate disaster mitigation material into the learning process in schools. This shows that disaster

mitigation education is no longer only delivered theoretically, but is beginning to be developed through various media that are more innovative, contextual, and in line with the characteristics of the students. (Santi et al., 2024).

In addition, research trends also show the dominance of digital technology-based teaching material development. Various products have been developed, including instructional videos, interactive worksheets, digital pocket books, thematic e-books, and web-based teaching materials (Wulandari et al., 2023). Digital media is considered more practical, flexible, and accessible to students, thereby increasing their motivation to learn, understanding of concepts, and involvement in the learning process (Putu et al., 2025). Thus, the use of digital technology has become an important strategy in developing more effective and engaging disaster mitigation learning for students.

On the other hand, not all studies focus on developing new media or teaching materials, but also emphasize the development of conceptual models, learning strategies, and theoretical studies that support the integration of disaster mitigation education into the curriculum. Several studies use a literature review approach, systematic review, and learning model development to formulate a conceptual framework for disaster educationn(Nikmah et al., 2024). These studies play an important role in strengthening the theoretical foundation and providing direction for the development of teaching materials and disaster mitigation learning practices at various levels of education.

A number of studies also emphasize the importance of integrating local wisdom values and contextual experiences into disaster mitigation learning (Suarmika et al., 2025). Local wisdom, such as the concept of stilt houses and traditional community knowledge about disasters, is seen as a relevant and meaningful source of learning for students (Tyasa et al., 2023). This approach shows that the development of disaster mitigation teaching materials is not only oriented towards technology and media innovation, but also towards utilizing the potential of local culture as part of a disaster education strategy(Hastuti & Sadeli, 2024). With this in mind, the development of disaster mitigation media and teaching materials in the curriculum is expected to produce students who not only understand disaster concepts, but also have awareness, resilience, and preparedness in facing disaster risks.

Integration of Disaster Mitigation into the Curriculum

Based on various studies that have been analyzed, it can be concluded that the integration of disaster mitigation into the education curriculum shows a growing and systematic trend. Disaster mitigation education is no longer positioned as additional material, but is beginning to be integrated thematically into various subjects at school. This integration is carried out to instill knowledge, attitudes, and preparedness skills from an early age in students. Several studies show that the education curriculum has begun to accommodate disaster risk reduction (DRR) education as part of efforts to build a disaster-aware culture in the school environment (Tyasa et al., 2023).

The integration of disaster mitigation into the curriculum is also evident through the use of various media and teaching materials designed in a contextual manner (Jannah et al., 2025). Learning media such as videos, educational games, digital pocket books, e-books, and web-based teaching materials are used as a means

to connect disaster-related material with classroom learning (Putu et al., 2025). The use of these media is not only intended to improve understanding of disaster concepts, but also to support the implementation of a more interactive curriculum that is relevant to developments in educational technology.

Research trends also show that disaster mitigation integration is not limited to a specific subject, but can be applied across disciplines (cross-curricular). Several studies show the integration of disaster mitigation material in science, social studies, mathematics, and even teacher education in elementary education study programs. This approach allows students to understand disaster phenomena from various scientific perspectives at once (Kosim et al., 2022) linking it to the surrounding environmental conditions. Thus, disaster mitigation learning can be more contextual, applicable, and meaningful for students (Putu et al., 2025).

On the other hand, a number of studies also emphasize the importance of integrating local wisdom values and experience-based learning approaches into disaster mitigation curricula (Santi et al., 2024). The use of local knowledge, such as the concept of stilt houses as a form of adaptation to earthquakes, shows that the culture and traditions of a community can be a relevant source of learning in disaster education (Wicaksono et al., 2025). In addition, the application of active learning methods, such as discovery learning, experiments, and experience-based learning, also supports the effectiveness of disaster mitigation integration in the curriculum (Afifah et al., 2025). Thus, the integration of disaster mitigation education into the curriculum is expected to produce students who have disaster literacy, environmental awareness, and better preparedness in facing potential disasters (Zullfriadi et al., 2025).

The Impact of Disaster Mitigation Education on Students

Thus, the integration of disaster mitigation education into the curriculum is expected to produce students who have disaster literacy, environmental awareness, and better preparedness in facing potential disasters (Santi et al., 2024). Integrating disaster mitigation material into learning enables students to recognize various types of disasters and understand the risks that may occur (Tyasa et al., 2023), and knowing the steps that need to be taken before, during, and after a disaster. Thus, disaster mitigation education plays an important role in instilling disaster awareness from an early age (Zullfriadi et al., 2025) and develop an alert and responsive attitude toward emergency situations (Wulandari et al., 2023).

In addition to improving conceptual understanding, disaster mitigation education has also been proven to develop various cognitive skills in students. Various studies show that the use of active learning models such as discovery learning, experiment-based learning, and interactive media can improve critical thinking, problem solving, and student engagement in the learning process. Through this approach, students do not only receive information passively, but are also actively involved in the process of discovering and understanding disaster mitigation concepts (Nikmah et al., 2024).

Another positive impact can be seen in the increase in learning motivation and the quality of student interaction with learning materials (Putu et al., 2025). The use of various learning media such as videos, educational games, digital pocket books, e-books, and web-based teaching materials can make disaster mitigation learning more interesting, interactive, and accessible (Afifah et al., 2025). These media help

students understand disaster concepts in a more visual and contextual way, making the learning process more effective and meaningful.

In addition, disaster mitigation education also contributes to the formation of a resilient attitude (Ayu & Fauzi, 2021), environmental awareness, as well as students' social readiness in facing disaster risks. Several studies show that integrating local wisdom values, science literacy, and experience-based learning can increase students' resilience to disaster situations while fostering a sense of responsibility towards the environment and society. Thus, disaster mitigation education not only has an impact on cognitive aspects but also on the formation of students' character, attitudes, and preparedness in facing various potential disasters in the future.

CONCLUSION

Based on the results of a literature review, disaster mitigation education integrated into the learning process in MI schools has been proven to play an important role in increasing students' knowledge, awareness, and preparedness for potential disasters. The application of the Discovery Learning model encourages active student involvement in the learning process, thereby improving conceptual understanding, critical thinking skills, and responsiveness to disaster risks.

In addition, the use of innovative media and teaching materials such as educational videos, interactive worksheets, digital pocket books, and web-based teaching materials supports more engaging and contextual learning. Overall, the integration of the Discovery Learning model and disaster mitigation education into the curriculum can be an effective strategy for building disaster literacy and shaping conscious, resilient attitudes in students from an early age.

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