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The development of disaster preparedness education for public: a scoping review

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Abstract

Background Disasters have become an increasing concern globally due to their devastating impacts on communities, economies, and infrastructure. The rising frequency and intensity of disasters necessitate a more comprehensive, proactive and systematic approach in preparing communities to mitigate and respond effectively. To address this, disaster preparedness education for public has emerged as a crucial component of disaster risk reduction strategies and plays a crucial role in enhancing the resilience of communities and minimizing the adverse effects of disasters.

Objective This scoping review aims to explore and map the key findings related to the development of disaster preparedness education for public and identify key themes, gaps, and challenges in this field.

Materials and methods A scoping review of literature was undertaken to assess research articles and preprints from the date of establishment to March 30, 2023. Databases included PubMed database (MEDLINE), ISI Web of Science (WOS), Google Scholar and Web of Science. Inclusion criteria were: (a) described preparedness education, (b) focused on an disaster or emergency. Data were narratively summarized and reported.

Results 95 articles met inclusion criteria and were finally included for the review. The included studies originated from 16 countries: the United States of America($n=51$), China ($n=6$), Iran ($n=6$), Japan($n=5$) and Turkey ($n=5$) accounted for the majority of them. Research designs of included studies consisted of one cohort study, thirty randomized controlled trials, one cross-sectional study, six qualitative studies, fifty-four quasi-experimental studies and three mixed-method studies. Research objects of included studies consisted of 8 types, of which all disasters ($n=58$), emerging infectious diseases ($n=13$), mass casualty incidents ($n=10$) and earthquake ($n=7$) accounted for the majority. Together, these studies involved 31,981 participants including citizens, emergency health care providers, families of special health care needs, as well as students from different medical areas. Thematic analysis of the charted findings led to the identification of three stressed themes: (1) factors influencing the development of disaster preparedness education, (2) models and frameworks for disaster preparedness education and (3) innovative approaches in disaster preparedness education.

Conclusion This review demonstrates a variety of factors impacting the development and implementation of simulation to assess characteristics of disaster preparedness education. Adoption of models and frameworks such

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as behavior change theories, risk communication models and innovative approaches could improve the quality and consistency of the disaster preparedness education.

Keywords Disaster preparedness education, Scoping review, Models and frameworks, Innovative approaches, Disaster and emergency medicine, Disaster management

Introduction

Disasters can strike at any time and in any place, and their impact can be devastating. From natural disasters such as earthquakes, floods, hurricanes, and wildfires to man-made disasters like industrial accidents, terrorist attacks, and pandemics, the consequences can be far-reaching and long-lasting [1–16]. For example, As of 2023, the COVID-19 pandemic has led to over 6.7 million deaths worldwide and economic losses in the trillions of dollars. Hurricane "Ian" caused at least $15 billion in damages in Florida, USA, and resulted in over 100 deaths in 2022. However, through effective preparedness measures, the severity of these disasters can be reduced, and lives can be saved [17–21].

Disaster preparedness education plays a crucial role in equipping individuals, communities, and governments with the necessary knowledge and skills to effectively respond to and mitigate the impact of disasters [22–28]. Disaster preparedness education encompasses a comprehensive range of activities that aim to increase awareness, enhance understanding, and build capacity in disaster risk reduction, response, and recovery.

The core components of disaster preparedness education including educating individuals about the potential hazards they may face, teaching them how to develop emergency plans, and training them in emergency response techniques. It also encompasses educating communities on the importance of developing resilient infrastructure, early warning systems, and fostering a culture of preparedness. Technology plays a pivotal role in enhancing disaster education by providing innovative tools and platforms that can improve the effectiveness and reach of educational initiatives. Incorporating technology into disaster education not only enhances the learning experience but also ensures that knowledge and skills are up-to-date with the latest advancements in disaster management. This integration is vital for preparing communities to respond effectively to disasters and build resilience in the face of growing global challenges.

Disaster preparedness education is not only vital for individuals and communities but also for governments and policymakers. By integrating disaster preparedness into educational curricula, governments can ensure that future generations are well-equipped to handle and manage disasters. Additionally, policymakers can use data and insights from disaster preparedness initiatives to inform policy decisions and allocate resources effectively to disaster risk reduction and response efforts. Thus, the purpose of this scoping review is two-fold: first, to explore the existing literature related to the current state of disaster preparedness education; second, to explore and map the key findings related to the development of disaster preparedness education and identify key themes, gaps, and challenges in this field.

Methods

A scoping review of literature was employed to map the scope and nature of the existing literature, determine the value of conducting a comprehensive systematic review and identify trends, patterns, and research gaps. This scoping review provides an overview of the existing evidence on studies focus on disaster preparedness education. The decision to undertake a scoping review as opposed to a systematic review was influenced by the insights of Munn et al. [29], who elucidate that systematic reviews are primarily concerned with the aggregation of quantitative data to appraise the efficacy of interventions and practices. Conversely, a scoping review emerges as a more fitting approach to achieve the following objectives: (a) to delineate the breadth of extant literature pertaining to a specific subject; (b) to offer a comprehensive survey of the conceptual frameworks associated with the subject; and (c) to pinpoint the lacunae within the existing body of literature.

Searching strategies

The systematic search was conducted across multiple electronic databases, including PubMed database (MEDLINE), ISI Web of Science (WOS), Google Scholar and Web of Science, using relevant keywords with the high number of occurrences as queries with the following terms: "disaster preparedness education," "disaster education programs," "disaster training," "community engagement," "technology in disaster education," and "community resilience." Inclusion criteria were set to include studies published in English from 2002, focusing on the development and advancements of disaster preparedness education, disaster preparedness education interventions and their outcomes. After screening the titles and abstracts, relevant articles were selected for full-text review and data extraction. Exclusion criteria of the study were as follows: (1) Reviews, books, letters to the editor, and conference presentations or speeches. (2) not related to disaster preparedness education. (3) not reporting outcomes, and not in English. After screening the titles and abstracts, relevant articles were selected

for full-text review and data extraction. Grey literature searches were conducted across various websites to identify pertinent case studies and reports. The initial 30 links, ranked by relevance, were subsequently evaluated against the established inclusion criteria. The search yielded a total of 9467 articles, of which 216 were selected for full-text review. After further evaluation, 95 articles were included in the review.

Data charting and analysis

Five researchers (LG, MF, LL, HC, WZ) engaged in the database extraction process following the removal of duplicate. To improve the accuracy of the data extraction and the eligibility of the full text, the title and abstract of all articles identified in the search was reviewed by each researcher to identify potentially eligible studies based on the inclusion criteria and exclusion criteria. The extracted information included author, year of publication, region of the institution of first author, sample size, design type, results and main findings, strengths and limitations, and main conclusions of the database. Any disagreements were resolved through discussion and consultation with the five reviewers to determine a unified decisions of inclusion or exclusion based on pre-defined inclusion and exclusion criteria.

Results

The systematic database search resulted in 9,467 records identified. Of which, the literature search yielded a total of 6,921 relevant non-duplicate citations screened after removal of duplicates. 216 articles were retrieved eligible for full-text screening after applying exclusion criteria. Of those, 95 articles met inclusion criteria and were finally included for the review. Disagreement among authors was resolved by discussion and consultation with the five reviewers based on pre-defined inclusion and exclusion criteria. Figure 1 presents the summary of the PRISMA flowchart of study selection.

Descriptive summary of the studies

The included studies were published from 2002, with 79 published in the last 10 years (i.e., 2012 and onward). Studies originated from 16 countries; the United States of America ($n=51$), China ($n=6$), Iran ($n=6$), Japan ($n=5$) and Turkey ($n=5$) accounted for the majority of them. Research designs of included studies consisted of one cohort study (24), thirty randomized controlled trials (2, 3, 7, 8, 10, 12, 13, 17, 19–21, 24, 27, 28, 34, 43, 51, 52, 58, 61–64, 66, 67, 69, 72, 83, 84, 88),one cross-sectional study(70), six qualitative studies (1, 5, 23, 40, 90,95), fifty-four quasiexperimental studies(4, 6, 9, 11, 14–16, 18, 22,

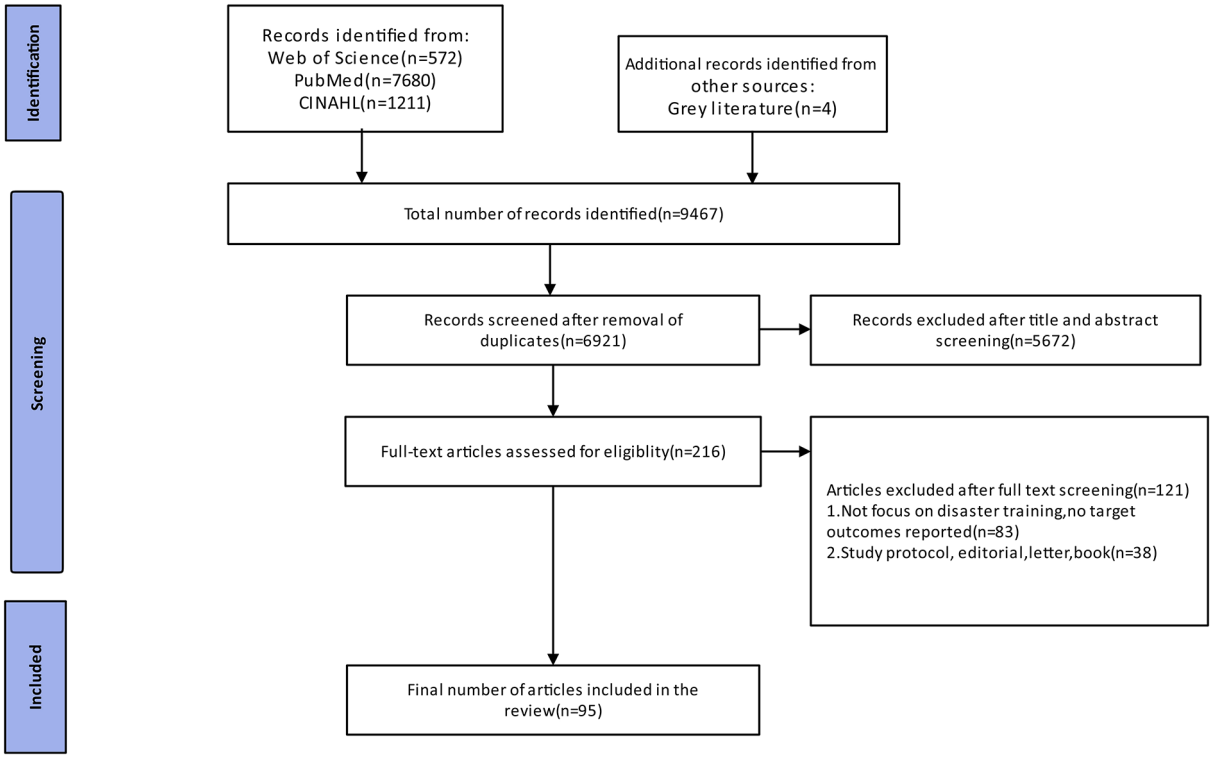

Fig. 1 Flowchart of the literature screening process

25, 26, 29–33, 35–39, 41, 42, 44–50, 53–57, 59, 60, 65, 73–76, 78, 80–82, 85–87, 89, 91–94) and three mixed-method studies (68, 71, 79). Research objects of included studies consisted of 8 types, of which all disasters ($n = 58$), emerging infectious diseases ($n = 13$), mass casualty incidents ($n = 10$) and earthquake ($n = 7$) accounted for the majority.

Together, these studies involved 31,981 participants including citizens, emergency health care providers, families of special health care needs, as well as students from different medical areas. Table 1 presents the general characteristics of included studies that in concert with the objective of the scoping review.

Narrative summary of the studies

A descriptive thematic analysis was meticulously crafted to synthesize the textual excerpts [25]. The comprehensive protocol for our scoping review endeavor [29] elucidates the adoption of thematic analysis in its entirety, occasionally referred to as reflexive thematic analysis [30, 31]. In addressing the issues under review, we have employed a descriptive thematic analysis approach. This selection was made in light of our methodology not involving the creation of a novel interpretive framework, but rather focusing on providing a thematic categorization of the research findings.Thematic analysis of the charted findings led to the identification of three stressed themes: (1) factors influencing the development of disaster preparedness education, (2) models and frameworks for disaster preparedness education and (3) innovative approaches in disaster preparedness education. Each stressed theme contains sub-themes regarding the development of of disaster preparedness education (see Table 2).

Reported stressed theme 1: factors influencing the development of disaster preparedness education

Government policies and initiatives

Government policies and initiatives play a crucial role in influencing the development of disaster preparedness education. These policies and initiatives provide a framework and guidance for educational institutions, organizations, and communities to implement effective disaster preparedness education programs [5, 25, 32].

One important aspect of government policies and initiatives is the allocation of funding and resources for disaster preparedness education. Governments can provide financial support to schools and organizations to develop and implement educational programs that focus on disaster preparedness. This funding can be used to train educators, develop educational materials, and create awareness campaigns to promote the importance of disaster preparedness [5, 25].

In addition to financial support, government policies and initiatives can also mandate the inclusion of disaster preparedness education in school curricula. By integrating disaster preparedness education into formal education systems, governments can ensure that young people

Table 1 General characteristics of included studies in this scoping review

General characteristics	Number	%	General characteristics	Number	%
Year of publication			**Design Type**		
Before 2010	6	6.32	Cohort study	1	1.05
2010–2020	65	68.42	Controlled trial study	30	31.58
After 2020	24	25.26	Cross-Sectional study	1	1.05
Region distribution			Qualitative study	6	6.32
Brazil	1	1.05	Quasiexperimental study	54	56.83
Canada	2	2.11	Mixed methods study	3	3.16
China	6	6.32	**Disaster Type**		
Denmark	2	2.11	All disasters	58	61.05
Greece	1	1.05	Armed conflicts	1	1.05
Haiti	1	1.05	Biological event	2	2.11
India	3	3.16	Chemical disasters	1	1.05
Indonesia	2	2.11	Earthquake	7	7.37
Iran	6	6.32	Emerging infectious diseases	13	13.68
Israel	2	2.11	Mass casualty incidents	10	10.53
Japan	5	5.26	Weather-related emergency	3	3.16
Korea	4	4.21	**Participants**		
Saudi Arabia	1	1.05	Citizens	5	5.26
Turkey	5	5.26	Emergency health care providers (physicians, advanced practice providers, nurses, residents, paramedics, and emergency medical technicians)	48	52.63
UK	3	3.16	Families of special health care needs (elderly adults, adults living independently, Earthquake victims, low income adults, pregnant women, et al.)	7	7.37
USA	51	53.67	Students	32	34.74

Table 2 Detailed key findings according to the reported stressed themes

References ID	Reported Stressed Themes	Key findings
[5, 25, 71]	Factors influencing the development of disaster preparedness education	**Government policies and initiatives**: provide a framework and guidance for educational institutions, organizations, and communities to implement effective disaster preparedness education programs.
[11, 18, 20, 22, 29, 36, 62]		**Community involvement and engagement**: provide important information about local disaster risks and preparation knowledge, formulate relevant policies and plans to enhance the resilience and response capabilities of the community.
[2, 9, 11, 13, 14, 17, 30, 42, 51, 56, 69]		**Role of educational institutions**: provide relevant courses and training, promote the progress of disaster preparation education through research and innovation
[12, 17, 27, 43, 48, 52, 54, 55, 57, 61, 83, 93]	Models and frameworks for disaster preparedness education	**Behavior change theories**: provide a framework for understanding the factors that influence preparedness behaviors and can guide the development of effective disaster preparedness education programs.
[21, 25, 83]		**Risk communication models**: provide a framework for developing effective risk communication strategies in disaster preparedness education.
[6, 26, 35, 38–40, 50, 63, 67, 72, 85, 86, 94]		**Curriculum development frameworks**: provide a structured approach and guidelines for the creation and implementation of educational programs focused on disaster preparedness.
[3, 4, 7, 19, 24, 46, 47, 59, 64, 65, 75, 84, 87, 92, 95]	Innovative approaches in disaster preparedness education	**Use of technology and digital platforms**:better disseminate and popularize knowledge about disaster preparedness.
[1, 5, 8, 10, 15, 16, 19, 23, 28, 31–34, 37, 41, 44, 45, 49, 53, 58, 60, 66, 68, 70, 73, 74, 76–82, 88–91]		**Simulation exercises and drills**: provide valuable training opportunities, help identify strengths and weaknesses in emergency plans, and allow individuals and communities to refine their response strategies.
[11, 18, 20, 29, 36, 62]		**Community-based participatory approaches**: refers to the innovative strategies and methods used in disaster preparedness education that involve active participation and collaboration with community members

are equipped with the necessary knowledge and skills to respond to and recover from disasters. This inclusion can also help create a culture of preparedness among future generations [25, 32].

Furthermore, government policies and initiatives can facilitate partnerships and collaborations between different stakeholders involved in disaster preparedness education. Governments can bring together educational institutions, non-governmental organizations, emergency management agencies, and community groups to share resources, exchange best practices, and coordinate efforts to enhance the effectiveness of disaster preparedness education programs [5, 25, 32].

Government policies and initiatives can also involve the establishment of regulatory frameworks and standards for disaster preparedness education. These frameworks can set guidelines for curriculum development, teacher training, and program evaluation. By establishing clear standards, governments can ensure that disaster preparedness education programs are comprehensive, evidence-based, and responsive to the specific needs and challenges of their communities [32].

Community involvement and engagement

In the development of disaster preparation education, the participation and investment of the community plays an important role. Community participation refers to the active participation and cooperation of community residents and related interests in disaster preparation education [11]. Community participation can be achieved in various ways, including but not limited to community conferences, workshops, training activities, volunteer organizations, etc. Community participation can not only provide important information about local disaster risks and preparation knowledge, but also help formulate relevant policies and plans to enhance the resilience and response capabilities of the community [18, 20].

Community participation can also promote interaction and exchanges between residents of the community, and enhance the cohesion and unity within the community [22].In the process of participating in disaster preparation education, community residents can share each other's experience and knowledge, support and help each other. This interaction and communication not only helps improve the level of disaster preparation, but also helps to form a closer and cohesive community, which can better cope with disaster risks and challenges [22, 29].

In addition, community participation can also provide more accurate and targeted disaster preparation education content and methods [33]. By understanding the needs and characteristics of community residents, you can design and implement disaster preparation education activities, and provide more practical and feasible suggestions and guidance.Community participation can also promote the sustainable development of disaster preparation education [34]. By cultivating and developing professional talents and resources within the community, a long-term effective disaster preparation education system is established.

Role of educational institutions

In the development of disaster preparation education, various factors have played an important role in its development [2]. Among them, educational institutions play a key role in promoting the development of disaster preparation for education. Education institutions, as an important place for cultivating talents and teaching knowledge, have rich educational resources and professional knowledge [9, 11, 13]. They can not only provide relevant courses and training, but also promote the progress of disaster preparation education through research and innovation [14, 17]. Education institutions can also cooperate with government, non-governmental organizations and communities to jointly carry out disaster preparation education projects and activities [30, 35, 36]. Through the active participation and efforts of educational institutions, disaster preparation education can better promote and popularize, and make important contributions to the improvement of the overall disaster response capacity of society [37, 38]. Therefore, educational institutions have an irreplaceable role in promoting the development of disaster preparation for education.

Reported stressed theme 2: models and frameworks for disaster preparedness education

Behavior change theories

Behavior change theories play a crucial role in disaster preparedness education as they help inform and guide the development of effective strategies to promote positive behavior change [12, 17]. Behavior change theories commonly used in the context of disaster preparedness education including: (1) Social Cognitive Theory: This theory emphasizes the role of observational learning and social influences in shaping behavior. In the context of disaster preparedness education, this theory highlights the importance of providing role models, demonstrating desired behaviors, and fostering social support networks [27, 39]. (2) Theory of Planned Behavior: This theory posits that behavior is influenced by an individual's attitudes, subjective norms, and perceived behavioral control. In disaster preparedness education, this theory suggests addressing attitudes, social norms, and empowering individuals to enhance their perceived control over preparedness actions [40, 41]. (3) Trans-theoretical Model: This model proposes that behavior change occurs in stages, including pre-contemplation, contemplation, preparation, action, and maintenance. In disaster preparedness education, understanding the stage of change can help develop targeted messaging and interventions to facilitate progress through the stages [42, 43]. (4) Diffusion of Innovations Theory: This theory focuses on how new ideas, behaviors, or innovations spread within a social system. In the context of disaster preparedness education, this theory suggests targeting early adopters and influencers within a community to promote the adoption of preparedness behaviors [44, 45]. (5) Health Belief Model: This model suggests that behavior change is influenced by an individual's perception of the threat, the perceived benefits of taking action, perceived barriers to action, self-efficacy, and cues to action [46, 47]. This model can guide the development of messaging and interventions that address these factors to promote preparedness actions.

These behavior change theories provide a framework for understanding the factors that influence preparedness behaviors and can guide the development of effective disaster preparedness education programs. It's important to consider individual and contextual factors when applying these theories and to tailor interventions to specific populations and settings. By incorporating these behavior change theories into disaster preparedness education programs, practitioners can develop tailored strategies and interventions that effectively promote positive behavior change and enhance community resilience.

Risk communication models

Risk communication models in disaster preparedness education refer to the frameworks or theories used to effectively communicate information and messages about risks and preparedness measures to individuals or communities to enhance their understanding and response to disasters [21, 25, 46]. Commonly used risk communication models in disaster preparedness education including: (1) The Risk Perception Model: This model focuses on how individuals perceive and interpret risks. In disaster preparedness education, this model emphasizes the importance of understanding and addressing people's concerns and anxieties about potential disasters [21, 25, 46]. (2) The Social Amplification of Risk Framework: This model recognizes that risk perception is influenced by social and cultural factors. It considers how information is disseminated and amplified through social networks, media, and interpersonal communication. In disaster preparedness education, this model can help identify influential channels for risk communication and understand how messages may be amplified or diminished through social networks [21, 25, 46]. (3) The Precaution Adoption Process Model: This model describes the stages individuals go through when adopting precautionary measures. It identifies factors that influence behavior change, such as perceived risk, self-efficacy, and awareness. Effective risk communication using this model involves tailoring messages to address these factors and guiding individuals towards taking appropriate actions [21, 25, 46]. (4) The Health Belief Model: This model considers factors such as perceived susceptibility, severity, benefits, and barriers in predicting behavior change. Effective risk communication using this model

involves addressing these factors to motivate individuals to engage in preparedness activities [21, 25, 46]. (5) The Crisis and Emergency Risk Communication Model: This model focuses on communication during crisis situations and emphasizes the need for timely, accurate, and consistent messages. It involves conveying information about the nature of the crisis, potential consequences, recommended actions, and sources of help [21, 25, 46]. Effective risk communication using this model involves considering audience needs, utilizing various channels, and addressing public concerns.

These models provide a framework for developing effective risk communication strategies in disaster preparedness education. By applying these risk communication models, disaster preparedness education efforts can be tailored to address specific factors that influence risk perception, decision-making, and behavior change. This can help enhance the effectiveness of communication strategies and promote informed and proactive responses to potential disasters. However, it is essential to adapt and tailor these models to specific contexts, populations, and types of disasters to ensure their relevance and effectiveness.

Curriculum development frameworks

Curriculum development frameworks play a crucial role in disaster preparedness education [6]. These frameworks provide a structured approach and guidelines for the creation and implementation of educational programs focused on disaster preparedness [26]. They assist in designing the curriculum to ensure that it meets the specific needs and goals of disaster preparedness education. These frameworks offer insights into how to organize and structure educational content effectively to enhance learning outcomes.

Curriculum development frameworks typically address key aspects such as the identification of learning objectives, the selection of appropriate instructional methods, the sequencing of content, and the assessment of learning outcomes [48]. They provide a framework for educators to develop a comprehensive and cohesive curriculum that covers essential topics related to disaster preparedness.

By examining different curriculum development frameworks, we can gain a deeper understanding of the best practices and strategies that can be employed to design effective educational programs for disaster preparedness [49–51]. These frameworks may include guidelines on the integration of practical exercises, case studies, simulations, and real-life scenarios to enhance the learning experience and prepare individuals to respond effectively in disaster situations [52–54].

Furthermore, curriculum development frameworks may also emphasize the importance of incorporating interdisciplinary approaches, involving stakeholders, and considering cultural and contextual factors when designing disaster preparedness education programs [55, 56]. This ensures that the curriculum is inclusive and tailored to the specific needs of different communities, taking into account the diverse demographics and socio-cultural considerations [57, 58].

Reported stressed theme 3: innovative approaches in disaster preparedness education

Use of technology and digital platforms

In the field of disaster preparedness education, innovative approaches are crucial for enhancing education effectiveness [3, 4, 7]. One such innovation is the utilization of technology and digital platforms [19, 24, 59, 60]. By using technology and digital platforms, we can better disseminate and popularize knowledge about disaster preparedness. For example, mobile applications or online courses can be developed to provide guidance and information on disaster preparedness to the public [61–63]. This approach can improve the accessibility and convenience of disaster preparedness education by utilizing the technological devices people use in their daily lives [64, 65]. Additionally, digital platforms can also be used for interactive learning and virtual simulations to cultivate students' emergency response abilities by simulating real-life disaster scenarios [66, 67]. Through these innovative technological means, disaster preparedness education can become more engaging and interesting, increasing learner participation and training effectiveness [68]. Therefore, the application of technology and digital platforms in disaster preparedness education is an effective and innovative approach.

Simulation exercises and drills

Simulation exercises and drills are an important aspect of disaster preparedness education [1]. They provide practical hands-on training and allow individuals and communities to practice their response to various disaster scenarios [1, 5, 8, 10]. Simulation exercises and drills commonly used in disaster preparedness education including: (1) Tabletop Exercises: These exercises involve a facilitated discussion of disaster scenarios in a classroom or conference room setting. Participants review emergency plans, roles, and responsibilities, and discuss how they would respond to different situations. It helps enhance coordination, decision-making, and communication among stakeholders [15, 16, 19, 23]. (2) Functional Exercises: Functional exercises involve the simulation of a coordinated response to a specific disaster scenario. It may include multiple response agencies and organizations working together in a realistic environment to test their capabilities and coordination. These exercises help identify gaps in resources, procedures, and communication protocols [28, 31–71, 72]. (3) Full-scale Exercises:

Full-scale exercises simulate a complete disaster scenario in a realistic setting. They involve the deployment of personnel, equipment, and resources to respond to the simulated event. These exercises provide a comprehensive evaluation of response capabilities, communication, and coordination among various entities [73–76]. (4) Evacuation Drills: Evacuation drills simulate the process of safely and efficiently evacuating an area during a disaster. Participants practice following evacuation routes, assembling at designated locations, and implementing necessary evacuation procedures. It helps individuals understand the importance of timely and orderly evacuations [77–80]. (5) Shelter-in-Place Drills: Shelter-in-place drills simulate situations where individuals need to stay indoors during a disaster. Participants learn how to secure the premises, gather essential supplies, and create a safe environment within the shelter [81–83]. It helps individuals understand the necessary precautions and actions to take when remaining indoors during emergencies. (6) Mass Casualty Incident Drills: These drills simulate scenarios involving a large number of casualties and focus on practicing medical triage and response. Participants practice quickly assessing and prioritizing patients based on the severity of their injuries, setting up medical treatment areas, and coordinating with other medical personnel [84–91]. (7) Emergency Communication Drills: Communication drills focus on practicing effective communication during emergencies. Participants simulate scenarios where they need to communicate with emergency responders, coordinate with different response teams, disseminate information to the public, and utilize various communication tools and technologies [92–95].

These simulation exercises and drills provide valuable training opportunities, help identify strengths and weaknesses in emergency plans, and allow individuals and communities to refine their response strategies. They contribute to building a resilient and prepared community capable of effectively responding to disasters.

Community-based participatory approaches

"Community-based participatory approaches" refers to the innovative strategies and methods used in disaster preparedness education that involve active participation and collaboration with community members [11]. This approach recognizes the importance of engaging the community as key stakeholders in disaster preparedness initiatives.

One aspect of community-based participatory approaches is the involvement of community members in the planning and development of disaster preparedness education programs [18]. This includes conducting needs assessments and gathering input from the community to ensure that the education programs are tailored to their specific needs and circumstances.

Another aspect is the utilization of local resources and expertise within the community [20]. This can involve training and empowering community members to become educators and trainers themselves, enabling them to effectively disseminate preparedness knowledge and skills to their peers and neighbors.

Community-based participatory approaches also promote active engagement and participation of community members in disaster preparedness activities [29]. This can include organizing community drills and exercises, establishing neighborhood-based disaster response teams, and encouraging individuals to develop their own personalized disaster preparedness plans [33]. Furthermore, this approach emphasizes the importance of building trust and fostering relationships within the community. By engaging community members in the decision-making process and valuing their knowledge and experiences, it promotes a sense of ownership and collective responsibility for disaster preparedness [34].

Discussion

The scoping review identified several key themes in the literature on disaster preparedness education. These themes include the factors influencing the development of disaster preparedness education, several common models and frameworks for disaster preparedness education, and innovative approaches in disaster preparedness education. The review also identified gaps in the literature, including the lack of standardized approaches, limited evaluation of interventions, and the under representation of vulnerable populations in educational programs.

The development of disaster preparedness education is influenced by a multitude of factors, each with its own set of complexities and implications. Societal and psychological factors, such as cultural norms and community engagement, significantly impact how disaster preparedness is perceived and integrated into educational programs. As discussed by Paton and Johnston [96–98], the need to assess and build the resilience of local communities is essential for effective disaster management. This resilience is not just about physical preparedness but also about the psychological capacity to manage, withstand, and recover from disasters. Economic factors, such as funding and resource allocation, dictate the scale and quality of disaster education initiatives. Adequate funding is crucial for the development and implementation of effective disaster preparedness programs, as well as for the training of educators and the creation of relevant materials. The influence of school funding on preparedness in disaster management cannot be overstated, as highlighted in a study by Njuru Hellen Wangui [58, 97].

Political will and policy support are also critical for the standardization and implementation of disaster preparedness education. National strategies for disaster risk reduction often include educational components, emphasizing the importance of policy support in shaping disaster preparedness education. This is evident in the work of Hoffmann [98], which underscores the need for community resilience and preparedness. Technological advancements have introduced new methods for delivering education and improving preparedness. However, they also highlight the digital divide, which is a significant barrier to equal access to education and information, particularly in vulnerable populations. This digital divide is a critical issue that must be addressed to ensure that disaster preparedness education is inclusive and accessible to all.

The significance of models and frameworks in disaster preparedness education cannot be overstated. They provide the structural foundation upon which educational programs are built, ensuring that they are effective, comprehensive, and contextually appropriate [58, 99, 100]. One of the primary purposes of disaster preparedness education is to enhance community resilience. The Integration of the Spheres model and the CBDRM framework emphasize the importance of community engagement and empowerment, which are crucial for sustainable preparedness and resilience. By fostering a sense of ownership and responsibility among community members, these models encourage proactive participation in disaster risk reduction activities. This, in turn, leads to more robust and effective disaster preparedness education programs that are tailored to the specific needs and capacities of the community [99–102]. Education plays a pivotal role in improving risk perception and social capital, which are key mediators in disaster preparedness. Through education, individuals and communities can better understand the risks they face and the measures necessary to mitigate these risks [100–103]. This understanding is crucial for translating knowledge into action, as it motivates communities to engage in preparedness activities. Moreover, education fosters social capital by building networks of trust and cooperation, which are essential for collective action during disasters. The literature highlights the interplay between education and experience in shaping preparedness actions. While prior disaster experience is a key driver of disaster preparedness, education can replace this experience by enhancing abstract reasoning and anticipation skills. This allows the better educated to undertake preventive measures without needing to first experience the harmful event and then learn from it. This aspect of education is particularly important in disaster risk reduction, as it enables communities to prepare for potential disasters even in the absence of direct experience. Disaster preparedness education must address vulnerability and strengthen response systems at various levels—local, national, regional, and international. Models and frameworks guide the development of educational programs that can predict and prevent disasters, mitigate their impact on vulnerable populations, and effectively respond to and cope with their consequences. By doing so, they contribute to the overall resilience of communities and the broader society.

Innovative approaches in disaster preparedness education are pivotal for enhancing community resilience and response capabilities. These approaches are not only transforming the way disaster education is delivered but also improving its effectiveness and reach. Education plays a critical role in enhancing risk perception and social capital, which are key mediators in disaster preparedness [101–104]. Studies have shown that formal education raises the propensity to prepare against disasters by improving risk perception and social capital. This suggests that education can replace disaster experience in learning and anticipating disaster risks, enabling better preparedness actions without the need for direct experience [102]. The integration of technology in disaster preparedness education is a significant innovative approach. Technological advancements such as AI, VR, and digital tools provide immersive learning experiences that enhance preparedness and response skills. For instance, the Mobile Learning Hub in the Philippines uses VR to raise disaster awareness and teach resilience to citizens, demonstrating the potential of technology in disaster education. These technologies not only increase engagement but also provide realistic simulations that can save lives during actual disasters. Community-based disaster risk reduction (DRR) has emerged as an effective innovative approach. It involves the active participation of communities in identifying their vulnerabilities and capacities, and in designing and implementing actions to reduce disaster risks. This approach recognizes the diversity within communities and the need for inclusive and tailored education programs that address the specific needs of different groups. Innovative approaches also involve integrating disaster education into existing curricula, such as geography and science [103–107]. This integration fosters the development of critical thinking skills among students and prepares them to respond effectively to disaster situations. By incorporating disaster education into the core curriculum, future healthcare professionals and other graduates are better equipped for effective disaster response. Innovative approaches in disaster preparedness education also focus on promoting psychological well-being. This is particularly important given the emotional and psychological challenges that can arise from discussing traumatic events. Educators are increasingly adopting trauma-informed teaching practices that

address the mental health concerns of students, contributing to their overall well-being and resilience [106–109]. Community engagement is a key innovative approach in disaster preparedness education. By involving communities in the design and implementation of educational programs, there is a greater likelihood of success. Community-based interventions that focus on teacher resilience and well-being have been shown to enhance the effectiveness of disaster education initiatives [105]. These interventions recognize the pivotal role of teachers in not only educating students but also in strengthening community resilience. Innovative approaches in disaster preparedness education are essential for adapting to the evolving nature of disasters and the diverse needs of learners. These approaches, including the use of technology, community-based DRR, integration into curricula, promotion of psychological well-being, and community engagement, are transforming disaster education and enhancing community resilience and preparedness. Continued research and dialogue are crucial to improve the effectiveness of these innovative approaches and to better prepare communities for disasters worldwide.

One of the major implications of this scoping review is the need for a standardized approach to disaster preparedness education. The review found a lack of consistency in the content, delivery methods, and evaluation measures used in educational interventions. This lack of standardization makes it difficult to compare and determine the effectiveness of different programs. Therefore, it is crucial to develop standardized guidelines and protocols for designing, implementing, and evaluating disaster preparedness education interventions.

Another important implication is the need for more rigorous evaluation of these interventions. While the review identified various educational strategies, there is a lack of robust evaluation methods to assess their impact on preparedness outcomes. Future research should focus on conducting well-designed studies with appropriate outcome measures to determine the effectiveness of different educational approaches. This will help identify the most effective strategies and facilitate evidence-based decision-making in disaster preparedness education.

The scoping review also revealed a gap in the inclusion of vulnerable populations in disaster preparedness education programs. Existing interventions primarily target the general population, neglecting specific groups such as older adults, individuals with disabilities, and marginalized communities. Future educational efforts should address the unique needs and challenges of these populations, ensuring their equal access to information, resources, and support in disaster preparedness.

Additionally, the scoping review highlighted the potential of technology in enhancing disaster preparedness education. While some studies explored the use of technology, such as mobile applications or virtual reality, the literature in this area remains limited. Future research should focus on harnessing the potential of technology to improve the accessibility, engagement, and effectiveness of educational interventions.

Conclusion and limitation

This scoping review has provided valuable insights into the existing literature on disaster preparedness education. In the studies identified in this review, disaster preparedness education is complex and requires a comprehensive understanding of the factors influencing its development, the models and frameworks that guide it, and the innovative approaches that are transforming it. Addressing the gaps in the literature and practice requires a concerted effort from all stakeholders, including the private sector, to ensure that disaster preparedness education is standardized, evaluated, and inclusive of all vulnerable populations. Future research should focus on evaluating interventions, targeting vulnerable populations, and exploring innovative approaches to enhance disaster preparedness education.

The limited number of databases will reduce the utility of review although this scoping review was so comprehensive. The further study should pay more attention to evaluation of the mentioned conceptual frameworks and their effectiveness.

Supplementary Information

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Supplementary Material 1

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LG and XH designed this scoping review, search strategy, searched databases, and conducted data analysis and interpretation. LG conducted the article screening process. MF, CH, HC, and WZ were involved in full-text reviewing of articles during the final stage of literature screening and extract information from literature. LG drafted the manuscript. All authors reviewed and approved it, contributed to the article, and approved the submitted version.

Author contributions

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Data availability

All data and materials used in this review are included in the main text.

Declarations

Ethics approval and consent to participate
Not applicable. Research ethics approval was not required for this scoping review as no humans or their tissues were involved.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Abbreviations
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