



A Skills-Based Disaster Literacy Framework to Improve Disaster Preparedness, Response, and Recovery

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Abstract

This study presents the development of the Disaster Literacy Core Skills (DLCS) framework, a structured, skills-based model designed to improve disaster preparedness, response, and recovery at the individual and societal levels. Using qualitative thematic analysis of interviews with 20 disaster experts from diverse backgrounds, the study identifies and categorizes core disaster literacy competencies into four skill domains: practical, cognitive, social, and adaptive. These competencies are further organized across the preparedness, response, and recovery phases of the disaster management cycle, including basic search and rescue (SAR) skills. The framework addresses a critical gap by moving beyond theoretical knowledge to emphasize actionable skills such as first aid, risk assessment, emergency communication, financial resilience, and psychological coping. Findings highlight the importance of integrating digital literacy, mental health support, and community engagement into disaster education. The DLCS framework provides a foundation for developing evidence-based policies, educational curricula, and resilience initiatives to equip individuals and communities with basic skills to effectively survive, adapt, and recover in the face of increasingly complex and unpredictable disasters.

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Introduction

Disasters pose significant threats to societies worldwide, disrupting lives, damaging property and infrastructure, and negatively impacting economic and social systems (CRED, 2023; Smith et al., 2023). Disaster preparedness and response are crucial for mitigating and reducing such consequences, and they require disaster literacy that supports understanding risks, appropriate response, and efficient recovery. Traditionally, preparedness has focused on infrastructure improvements, response planning, and emergency aid distribution (McEntire, 2021; Paul & Juran, 2025). While these domains are essential, many disaster-affected populations may benefit from other skills to support themselves and their communities in crisis. A comprehensive approach to disaster literacy can merge theoretical knowledge with practical, cognitive, social, and adaptive skills to equip individuals for: risk recognition and assessment; informed



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decision-making; communication and coordination with emergency responders and community members; adaptation to rapidly changing environments; and psychological stress management.

While disaster management frameworks exist, they often fail to address necessary skills and knowledge related to disasters (Bradley, 2025; Farokhzadian et al., 2024; Guo et al., 2025; McEntire, 2021; Phillips & Mincin, 2023). In this context, social capital approaches have gained prominence for enhancing individual and societal resilience, demonstrating the impact of social capital on recovery and demonstrating the value of trust, solidarity, and network structures (Aldrich 2012). This study focuses on how social ties—coupled with individual skills—can be integrated into disaster literacy, resulting in the creation of the DLCS framework. The DLCS framework reflects the growing need for a structured, skills-based approach to disaster literacy integrated into education, training programs, and public awareness campaigns. Thus, this study seeks to identify, categorize, and analyze the essential disaster literacy skills required for preparedness, response, and recovery. By developing the DLCS framework, this study provides a structured competency model to enhance disaster resilience at the individual and community levels. Importantly, this work is original in combining four skill domains (practical, cognitive, social, and adaptive) with both temporal phases and search-and-rescue (SAR) skills, thus advancing scientific and practical understandings of disaster literacy to address real-world needs.

Research Questions and Research Gaps

This study seeks to answer the following questions:

1. What are essential disaster literacy skills that individuals and communities need to prepare for, respond to, and recover from disasters?
2. How can these skills (including search and rescue (SAR)) be categorized and prioritized to improve training, assessment, and real-world disaster readiness?
3. To what extent can the DLCS framework be integrated into training, curricula, and community resilience initiatives?

Disaster literacy is more than just knowledge—it encompasses the skills to act efficiently in life-threatening situations, both individually and in community contexts. This research examines disaster literacy from these perspectives, recognizing that effective disaster response is a collective effort that requires actions across several dimensions. Therefore, this study includes a consideration of core competencies and skills that are necessary: (1) before a disaster (preparedness, evacuation planning, stockpiling resources, risk awareness); (2) during a disaster (decision-making under pressure, first aid, emergency communication); and (3) after a disaster (resource management, mental health recovery, long-term resilience planning).

The goal is to contribute to practical training programs, policy recommendations, and digital disaster literacy initiatives. This work seeks to facilitate: the creation of more comprehensive curricula to enhance emergency manager, first responder, and community member education and training; the development of policy recommendations to better integrate disaster literacy into education; and the equipping of individuals and communities with knowledge and skills to protect lives and resources. By identifying and classifying essential disaster skills (and creating a structured, scalable, and adaptable disaster literacy framework), this study provides a systematic approach to disaster literacy that fosters the preparation of individuals and communities to navigate crises and recover effectively.

While many studies on disaster literacy focus on information dissemination, early warning systems, and multi-hazard awareness (Dufty, 2020; Guo et al., 2025; Hamid et al., 2021), the DLCS framework transcends these by offering a skills-based and practice-oriented approach. Guo et al.'s (2025) comprehensive review emphasizes the need for disaster education to be supported by behavioral change models. In response, the DLCS framework integrates practice by categorizing skills directly applicable to disaster contexts (e.g., crisis decision-making, psychological resilience, SAR competencies). Additionally, the framework's inclusion of "social skills" and "community engagement" directly relates to the role of social capital in disaster resilience (Aldrich, 2012) as strong social ties cultivate emotional support, resource sharing, and collective decision-making.

Community-based disaster response has gained attention, yet spontaneous and untrained participation in SAR can pose safety risks. Without coordination, spontaneous and unaffiliated volunteers can endanger themselves and official responders (Daddoust et al., 2021; Krogh & Lo, 2023; Simsa et al., 2019). A range of programs and trainings exist to teach volunteers how to meet personal and community disaster needs, including specialized populations (e.g., administering first aid to children and infants). Existing programs include the U.S. Federal Emergency Management Agency's (FEMA) Community Emergency Response Team (CERT) focus on core SAR competencies (e.g., evacuation, basic first aid,



coordination (FEMA-a, n.d.), Civil Air Patrol's defined protocols for previously licensed individuals (CAP, 2025), "Stopping Bleeding" program's training for tourniquet use and wound compression (DHS, n.d.; Jacobs, 2016), and American Heart Association and Red Cross' age-differentiated modules for CPR and AED use (Topjian et al., 2021).

Recent bibliometric and text mining analyses highlight the evolving landscape of disaster education, pointing to thematic trends like health services, school-based practices, and digital literacy as drivers of institutionalized disaster awareness (Çoban and Önal, 2023; Han and Chun, 2021; Horrocks et al., 2019; Soderin et al., 2023). However, curricular studies indicate that disaster education often remains fragmented and inconsistently embedded. Comparative studies demonstrate that while Japan adopts an interdisciplinary approach, Turkey and the U.S. primarily limit disaster literacy to social studies courses, limiting systemic integration (Çalışkan, 2024; Köstekçi and Üstünyer, 2024; Kotan, 2024; Sözcü and Aydınöz, 2019). The DLCS framework instead proposes a multi-layered approach that includes children and adults, local populations, and professionals—extending education beyond the classroom.

Kitagawa (2021) advocated for disaster education as a distinct subdiscipline within education and conceptualized it in two ways: as a strand of lifelong learning or as a form of public pedagogy. Engaging both conceptualizations, Kitagawa (2021) advocates for embedding disaster education within public pedagogy, emphasizing its relevance and utility for engaging broader communities. DLCS integrates this perspective, positioning disaster education not merely as knowledge transmission but as a socially embedded, skills-focused process extending beyond formal education.

The DLCS framework seeks to offer a practical solution by presenting a skills-focused model to span disciplines, technologies, and approaches. At the community level, participatory and volunteer-based approaches emphasize linking disaster education to daily life and psychosocial well-being, especially in disadvantaged contexts (Gist and Lubin, 2013; Joshua et al., 2023; Karacaoğlu and Özkaya, 2023). The effectiveness of disaster education depends not only on knowledge transfer but also on regular exercises and community-based preparedness; this informs the DLCS framework's focus on actionable skills and resilience-building practices (Guo et al., 2025; Uz et al., 2022). Finally, the growing importance of digital disaster literacy through virtual reality (VR) and geographic information science (GIS) aligns with DLCS's emphasis on applied, technology-enhanced competencies (Karacaoğlu, 2024a; Scott et al., 2013a, 2013b; Wang et al., 2023). Together, these perspectives reinforce the framework's ability to bridge education policies, digital transformation, and local community needs.

Additionally, the DLCS framework is designed to be applicable at both individual and community levels. While studies like Zhang et al. (2024) and Farokhzadian et al. (2024) offer profession-focused contributions, DLCS positions individuals as active citizens and community members. The lack of psychosocial resilience noted by Zhang et al. (2024) is systematically addressed in the DLCS framework as *adaptive skills*. Resilience is assessed more broadly in *crisis thinking skills and resource adaptation*. Farokhzadian et al. (2024) highlight skill-based deficiencies among healthcare professionals with disruptions to decision-making, communication platforms, and teamwork. Thus, DLCS recommends developing preventative capacity by integrating these deficiencies into skill tables for all individuals.

Studies reveal that skills and behaviors such as calmness, information sharing, helping, and coordination are vital during disasters (Kendra and Wachtendorf, 2003; Rodriguez et al., 2006; Karacaoğlu, 2024b). These attributes—which align with community-based resilience, mutual aid, psychosocial support, organizational flexibility, decision-making capacity, and prosocial behavior—are embedded in the DLCS framework's *social* and *adaptive skills*. These also relate to preparedness skills emphasized by Karacaoğlu and Biamba (2025) (e.g., household arrangements, identification of evacuation points, training, and drills), which are classified in DLCS under *cognitive* and *practical skills*.

Research Methods and Design

This study employs a qualitative, exploratory research design to systematically examine the fundamental skills that U.S. experts consider required for disaster preparedness, response, and recovery. The study aims to identify core preparedness, response, and recovery skills, using expert interviews and thematic content analysis to classify them into four main categories: practical, cognitive, social, and adaptive. Research was conducted in three phases:

1. Data Collection: Expert interviews with a broad set of disaster field professionals.
2. Data Analysis: Thematic coding and categorization of skills.
3. Framework Development: Structured classification of DLCS competencies.



Data Collection

Data were collected through semi-structured interviews with 20 experts in the broad disaster field at the national level in the U.S. The interviewees possess a diversity of expertise, including disaster-related research and practice related to social sciences, medicine, engineering, risk and vulnerability analytics, and emergency management. Interviews were conducted using a semi-structured guide drawing on disaster literacy literature. Purposeful questions tailored to each participant's responses and expertise were added in real time. Semi-structured interviews allowed for in-depth exploration of key disaster literacy competencies and were guided by core questions:

1. What basic disaster preparedness skills should an informed citizen possess?
2. What basic skills are required before, during, and after a disaster?
3. What are the most essential SAR skills?
4. How can these skills be classified to improve disaster literacy education and training?

The 20 experts were selected through purposive sampling based on professional expertise. The sample included experts from federal agencies, local emergency services, non-governmental organizations (NGOs), and academic institutions in the U.S. Participants were recruited through emails sent to professional networks and public directories of emergency management associations. Participation was voluntary and not compensated. Thirteen participants were affiliated with universities or disaster research centers; two represented government or public-sector organizations; two were affiliated with non-governmental or community resilience organizations; two were emergency management practitioners or consultants; and one specialized in healthcare and disaster medicine. Collectively, the sample included expertise in disaster research, emergency management, public health, disaster medicine, community resilience, risk reduction, recovery, and search-and-rescue-related activities, providing a multidisciplinary foundation for development of the DLCS framework. Each Zoom interview lasted approximately 45–60 minutes. Thematic saturation was reached after approximately 18 interviews, and no new codes emerged in the last two interviews. The interview protocol and questions are included in Supplemental Material 1.

It is important to note that the focus on U.S.-based experts is a limitation of this work in its current state (while recognizing that many of the experts and all of the authors have worked in this field in the international context). Therefore, to improve and better test the DLCS, working collaboratively with international experts whose primary expertise, experience, and cultural backgrounds are in non-U.S. contexts will be essential.

Data Analysis

Data obtained through semi-structured interviews were analyzed thematically using Braun and Clarke's (2006) model. Analyses involved transcription and coding, skill classification, and mapping individual and community skills. After transcribing all interviews, transcriptions were coded to identify key skill-based themes, which were then classified into practical, cognitive, social, and adaptive competencies. In addition, each skill was examined at both the individual and community levels, with DLCS skills classified into the four competency areas through inductive coding. Practical skills include skills like first aid, evacuation, and navigation. Cognitive skills include awareness, risk assessment, and decision-making. Social skills include communication, teamwork, and collaborative responses. Finally, adaptive skills include psychological resilience, problem-solving, and flexibility, specifically in crises. Each skill set was then mapped to individual and community applications, leading to the creation of structured competency tables.

Framework Development

The initial analysis resulted in five structured tables (Tables 1-5) that classify DLCS into skills used before, during, and after a disaster, as well as specialized SAR skills. Each table provides a detailed classification of individual and population-level skills to support future assessment instruments and educational curricula. Triangulation, intercoder agreement, and iterative refinement ensure validity and reliability. Findings were first compared across multiple expert domains to validate themes. Initial open coding was conducted independently by two researchers. Codes were then reviewed, refined, and grouped into themes representing key skill areas. Intercoder agreement was assessed using Cohen's Kappa, yielding a reliability score of 0.82, indicating substantial agreement. The authors then iteratively refined the skill classifications to improve accuracy.



Results

This study categorizes practical, cognitive, social, and adaptive skills at the individual and community levels to contribute to a more disaster-ready society (Figure 1). Based on semi-structured interviews with disaster researchers and practitioners, four categories of basic disaster preparedness skills were identified: practical, cognitive, social, and adaptive (Table 1). Synergy among skill categories highlights the importance of a multi-layered preparedness strategy. While individual preparedness is critical, an additional focus on community-wide preparedness efforts (e.g., large-scale exercises, collaborative training) can enhance resilience. As disasters increasingly rely on technology-driven early warning systems, it remains beneficial to include digital literacy in preparedness.

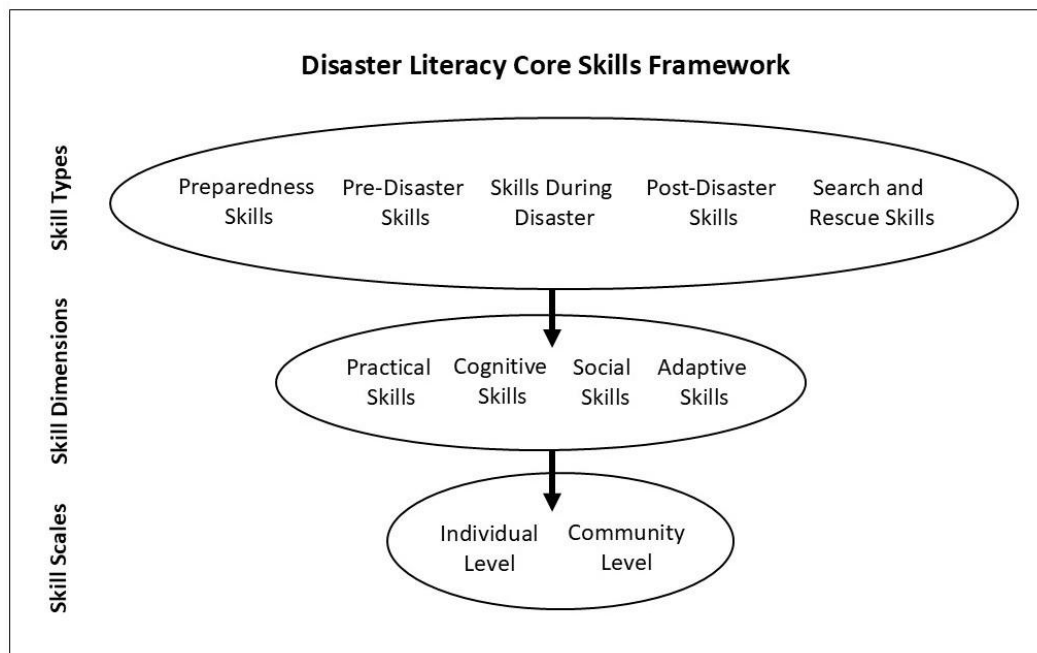


Figure 1. Conceptualization of the Disaster Literacy Core Skills (DLCS) framework comprises overlapping planes of skill types, skill dimensions, and skill scales.

Table 1. Basic disaster preparedness skills

Skills Category	Skill Type	Individual Skills	Community Skills
Practical	First Aid & Medical Care	Basic Skills	Shared Training
	Emergency Planning	Family Level Plans	City-Wide Plans
	Emergency Kit Preparation	Stocking Household Supplies	Creating Shared Public Facilities
Cognitive	Situational Awareness	Personal Recognition of Warning Signs	Shared Risk Assessment
	Disaster Literacy	Personal Understanding of Disaster Types	Public Education
Social	Emergency Communication	Family Communications	Mass Alerts

Skills Category	Skill Type	Individual Skills	Community Skills
Adaptive	Community Engagement	Local Support Networks	Neighborhood Response Teams
	Resilience & Stress Management	Learning Personal Coping Skills	Offering Mental Health Programs
	Resource Adaptability	Using Resources Effectively	Developing Training Programs

The *practical skills* (Table 1) emphasize emergency response and survival, focusing on hands-on, actionable abilities that contribute to individual and community disaster preparedness, such as first aid and medical care: “Knowing basic first aid and CPR can be life-saving. We [at disaster-related institution] emphasize that community-wide first aid training should be as common as fire drills” (Interviewee 2) and “After a disaster, professional help might not arrive immediately. The ability to provide first aid within the first few minutes is crucial” (Interviewee 5).

Creating emergency plans for preparedness and evacuation is critical. This includes household awareness of evacuation routes and safe places, as well as municipal disaster plans integrated with community-wide response strategies to enhance logistics and resources. As Interviewee 3 described: “Preparedness isn't just about individual readiness; it's about ensuring that families and communities know where to go and what to do.” Interviewee 7 illustrated this at the community scale, noting how “In some communities, disaster plans exist on paper but are not practiced. Hands-on simulations can bridge this gap.” Emergency kit preparation is another practical skill that supports survival and self-sufficiency, stressed by Interviewee 9: “We found that many individuals think they are prepared, but their kits lack key items like medications or pet supplies.” Public emergency storage facilities contribute to community engagement and social support by providing resources to those in need.

Cognitive skills (Table 1) enhance an individual's ability to assess risks, process information, and make informed decisions, including the awareness, critical thinking, and knowledge to understand and respond appropriately before and during disasters. The ability to recognize risks and early warning signs aligns with situational awareness and risk assessment, allowing people to take appropriate actions, “a skill that should be taught in school,” per Interviewee 6. Community-level risk assessments aid financial and logistical preparedness by helping cities allocate resources, as emphasized by Interviewee 11, who stated that they can “help people understand their specific risks and take proactive measures.”

Disaster literacy, in addition to digital and technological literacy, provides the knowledge to understand different types of disasters and to access reliable information. Public disaster education programs promote widespread preparedness, fostering community engagement and strengthening social support. Interviewee 8 noted that “Understanding different types of disasters and their warning systems can make the difference between timely evacuation and catastrophe.” Interviewee 14 underscored this with a specific example, detailing how “During hurricanes, people often don't understand the difference between a ‘watch’ and a ‘warning,’ which leads to delayed responses.”

Social skills (Table 1) bridge the gap between individual and collective action to ensure well-coordinated disaster response efforts, focusing on cooperation, communication, and group support. As Interviewee 1 mentioned, “Families need clear communication plans. During major disasters, phone lines fail—so alternative methods like radios or designated meeting points are crucial.” Mass notification systems can strengthen digital literacy by leveraging technology to alert communities to impending dangers. However, they should be “multilingual and accessible to all, including individuals with disabilities,” as Interviewee 13 described.

Building support networks helps build social capital, strengthen community resilience, and ensure that vulnerable individuals receive disaster warnings and assistance. Organizing neighborhood response teams prepares local communities to act quickly and effectively: “Communities that organize before a disaster recover faster. Simple neighborhood response teams can significantly reduce casualties” (Interviewee 10). Interviewee 15 added that “People often assume that emergency services will handle everything, but the reality is that first responders are overwhelmed. Mutual aid networks are key.”

All of these point to the crucial role of adaptive skills, enabling individuals and communities not only to survive disasters but also to recover and strengthen future preparedness. Adaptive skills (Table 1) include social and emotional resilience and flexibility, as well as the ability to manage resources and plans. Coping with fear and uncertainty is important for stress management and assists in decision-making. As



Interviewee 12 noted, “Psychological resilience is often overlooked in disaster preparedness. Coping strategies should be part of every training program.” Interviewee 18 pointed out, “We saw firsthand in disaster zones that emotional stability helps people make better decisions under pressure.” Mental health programs foster this skill at the community level and help provide collective emotional support after disasters.

Using available resources efficiently aligns with survival skills and self-efficacy, and supports people in improvising solutions when normal systems fail. Interviewee 20 described how, “In a crisis, people need to learn how to maximize the resources available to them, whether it’s purifying water or using debris to create shelter.” Interviewee 16 described similar needs, illustrating how “Survival isn’t just about what you have—it’s about how you use it. Improvisation is a core skill in disaster response.” At the community level, disaster resilience training programs enhance SAR knowledge and equip societies with the skills to respond flexibly.

By combining practical, cognitive, social, and adaptive skills, the classification equips individuals and communities to deal with disasters (Table 1) effectively. The classification aligns with existing preparedness frameworks and preparedness predictors (Kirschenbaum, 2002; Ablah et al., 2009; Kohn et al., 2012), making it a potential foundation for developing educational programs, policy recommendations, and training modules. Preparedness skills across the practical-cognitive-social-adaptive dimensions can be further classified into useful skill sets for pre-, peri-, and post-disaster stages, discussed in the following sections.

Basic Skills Before a Disaster

Basic pre-disaster skills align with the practical, cognitive, social, and adaptive dimensions at the individual and community levels (Table 2). The classification provides a structured approach to essential pre-disaster skills, ensuring that everyone is well-equipped, knowledgeable, and organized before a disaster occurs. Through integration, the DLCS framework provides a holistic strategy for pre-disaster resilience.

Table 2. Basic skills before a disaster

Skills Category	Skill Type	Individual Skills	Community Skills
Practical	Evacuation Planning	Identifying routes and shelters	Citywide drills
	Stockpiling Resources	Gathering essential supplies	Resource hubs
Cognitive	Risk Awareness	Understanding vulnerabilities	Hazard mapping
	Disaster Preparedness Education	Learning how to react to various disasters	Public information campaigns
Social	Coordination & Family Planning	Ensuring all household members understand protocols	Organizing collective preparedness programs
Adaptive	Financial Readiness	Setting aside emergency funds	Disaster relief and assistance planning
	Health Preparedness	Ensuring continuity of care	Health emergency strategies

Practical skills focus on emergency survival planning and resource management. DLCS practical skills encompass pre-disaster actions such as identifying escape routes and safe shelters, supporting transportation and evacuation themes. As Interviewee 3 noted, “Knowing evacuation routes and safe zones before a disaster is essential. People need to internalize these routes through regular drills because, in a real emergency, panic can impair decision-making.” Conducting citywide evacuation drills aligns with community and social preparedness and helps local governments and organizations test emergency plans. Additionally, gathering essential supplies (e.g., food, water, medicine, copies of important documents) is



essential for logistics and financial preparedness planning. Interviewee 7 described how “Many citizens underestimate the importance of having a well-stocked emergency kit. It’s not just about having supplies—it’s about having the right supplies, knowing where they are, and how to use them effectively.” At the community level, establishing emergency resource centers fosters community engagement and social support.

Cognitive skills include knowledge, awareness, and decision-making abilities that are critical pre-disaster. DLCS cognitive skills are fundamental in shaping behavior and preparedness mindsets, ensuring that people have the knowledge and awareness to respond appropriately to disasters. Understanding personal vulnerabilities and environmental risks aligns with knowledge and risk awareness and supports recognition of potential hazards: “Understanding local hazards [...] needs to translate into action. If someone lives in a flood-prone area, they should know how to respond differently than someone in an earthquake zone” (Interviewee 5). Community-wide hazard mapping supports local authorities’ analysis of risk-prone areas and implementation of preventive measures.

Learning how to respond to different disasters prepares individuals to make informed decisions in emergencies. This aligns with the digital and technological literacy theme, as individuals must comprehend and react to warning systems effectively. Meanwhile, public information campaigns help educate the population on disaster types, warning signs, and preparedness strategies. Interviewee 9 argued that “A major gap in preparedness is the lack of education about risk interpretation. People often don’t understand the difference between a watch and a warning. Disaster education must focus on teaching people how to interpret and act on alerts.”

Social skills increase resilience and cooperation, embedding preparedness as a coordinated, community-wide approach and individual effort. DLCS social skills emphasize communication, coordination, and collective action to support disaster readiness. Ensuring all family members understand emergency protocols aligns with disaster planning and preparedness and helps families develop structured communication and evacuation plans. As Interviewee 6 described, “The single biggest preparedness failure I’ve seen is the lack of family communication plans. People assume they can contact loved ones in a disaster, but network failures are common. Families need backup communication methods.” Organizing community preparedness programs allows neighborhoods to collaborate on social and community preparedness initiatives, with Interviewee 8 noting, “Communities that train together and plan collectively recover faster because they have a built-in support network.”

Adaptive skills focus on building protection and resilience, ensuring individuals and communities can recover quickly and efficiently. DLCS adaptive skills focus on long-term sustainability, resilience, and preparedness for unforeseen circumstances. Setting aside emergency funds is critical, aligning with financial and logistics planning to ensure individuals have money for basic needs during and post-disaster, meaning that “Teaching financial preparedness, such as having emergency cash reserves and understanding insurance claims, should be a priority” (Interviewee 4).

Disaster relief planning prepares governments and organizations to distribute financial assistance, housing resources, and recovery funds. Continuity of medical care and medications is important for first aid and public health, especially for individuals with chronic conditions. Interviewee 2 discussed this, interweaving disaster and non-disaster skills and knowledge: “Ensuring access to necessary medications and medical equipment in an emergency can be the difference between life and death.” Community-based health emergency strategies include stockpiling medical supplies, training first responders, and building hospital preparedness and capacity.

Together, the skills in Table 2 unite key themes, providing a comprehensive approach to pre-disaster planning. The balance between practical (stockpiling, evacuation planning) and cognitive skills (risk awareness, preparedness training) empowers individuals to act decisively based on accurate information. The importance of societal participation (coordination, collective preparedness, and public campaigns) reinforces that preparedness is a community-wide effort, not solely an individual responsibility.

Basic Skills During a Disaster

Practical, cognitive, social, and adaptive skills during a disaster (Table 3) align with key themes of disaster response by emphasizing safety, communication, medical aid, and resilience. *Practical skills* focus on emergency survival, first aid, and mobility strategies to empower individuals and communities, minimize harm, and maximize safety. DLCS practical skills encompass immediate lifesaving actions. Following planned evacuation routes supports the evacuation and safe movement theme and helps individuals avoid hazardous areas to reach their destination safely. As Interviewee 4 highlighted, “Knowing your evacuation routes ahead of time can mean the difference between safety and being trapped.” Relatedly, Interviewee 8 described how “One of the biggest challenges we see is people hesitating to leave because they underestimate how quickly conditions change. Early action is key.” At the community scale, coordinating



emergency transportation services increases community engagement and social support and helps large groups evacuate safely.

Table 3. Basic skills during a disaster

Skills Category	Skill Type	Individual Skills	Community Skills
Practical	Safe Evacuation & Navigation	Following planned routes	Coordinating transportation services
	Providing First Aid	Administering CPR and wound care	First responder teams
Cognitive	Crisis Decision-Making	Making quick, informed choices under stress	Emergency management strategies
	Situational Assessment	Evaluating immediate risks and adapting	Hazard assessment teams
Social	Emergency Communication	Alerting family and authorities	Maintaining mass emergency information systems
	Assisting Others	Helping neighbors and vulnerable individuals	Volunteer networks
Adaptive	Psychological Coping Strategies	Maintaining mental clarity under pressure	Psychological support
	Improvisational Problem-Solving	Adapting to unexpected situations with limited resources	Emergency resource-sharing

Administering CPR and first aid helps ensure immediate medical attention is available before professionals arrive. Interviewees 6 and 12 stressed the critical nature of this timing: “In mass casualty events, the first few minutes are critical—if even a handful of community members know basic CPR and wound care survival rates improve drastically,” and “Many people assume professional help will be there immediately. In reality, first responders can take hours to arrive.” Community first responders further help manage injuries and prevent mortality.

Cognitive skills help individuals and communities analyze risks, adapt to evolving crises, and make informed survival decisions, as evidenced in DLCS skills such as decision-making, awareness, and risk assessment. Making quick, informed, rational choices under stress fosters situational awareness and decision-making. Interviewee 3 positioned this as “an acquired skill. We’ve seen that those who rehearse disaster scenarios make quicker, better choices when under pressure.” Similarly, Interviewee 10 noted that “Crisis training decision-making reduces hesitation and increases survival rates.” Community emergency management strategies overlay collective decision-making skills in disaster scenarios.

Assessing immediate risks and adapting actions aligns with situational awareness and empowers people to recognize hazards such as fire, flood, and structural instability. Interviewee 5 illustrated this, describing how “In disasters, people fixate on one danger and ignore others. For example, after an earthquake, they focus on collapsed buildings but forget about gas leaks. Situational awareness must be dynamic.” At the community level, hazard assessment teams facilitate collective risk reduction by enabling local populations to monitor and respond to evolving conditions. As Interviewee 14 noted, “Community hazard assessment teams help a lot. By delegating risk monitoring, individuals can focus on their own immediate safety while experts assess broader risks.”

Social skills reinforce the importance of communication, cooperation, and mutual aid in building disaster resilience, all of which are translated into DLCS skills. Alerting family and authorities keeps individuals connected and informed of ongoing developments. Interviewee 2 explained how “In large-scale emergencies, cell towers fail. People need to have alternative ways to communicate, such as battery-powered radios or designated meeting spots.” Maintaining mass emergency information systems strengthens community crisis response and ensures reliable communication networks are in place. This must also include accessible mass communication, as Interviewee 9 illustrated: “Mass alert systems are



crucial, but they need to be multilingual and accessible to vulnerable populations, including those with disabilities.”

Assisting neighbors and vulnerable individuals is crucial to community engagement and social support, ensuring no one is left behind. Interviewee 7 explained that “People are often willing to help but don’t know how. Disaster preparedness training should include clear guidelines on how to assist without putting oneself in danger.” Community-led volunteer networks enhance relief coordination, enabling organized response efforts to assist, as Interviewee 15 clarifies: “Neighbors, not rescue teams, save many lives.”

Adaptive skills help individuals and communities remain calm and resourceful, enabling them to respond effectively to disasters. DLCS adaptive skills focus not only on resilience, but specifically on emotional resilience and problem-solving in crises. Interviewee 11 said, “Panic isn’t as common as people think, but emotional paralysis is. Teaching mental coping strategies helps people act decisively instead of shutting down in fear.” Maintaining mental clarity under pressure is important for psychological coping and community support, which help individuals manage anxiety and stress. Community-based psychological support helps trauma recovery efforts for affected individuals. Interviewee 17 emphasized this by noting, “Trauma recovery starts in the disaster itself. Communities with psychological support systems in place see faster emotional recovery and long-term resilience.”

Adapting to unexpected situations with limited resources strengthens disaster response capacities and equips individuals to identify alternative solutions. As Interviewee 1 stated, “the ability to adapt is a survival skill. Resourceful people—who can purify water, make shelter, or create makeshift medical supplies—do significantly better in disaster situations.” Interviewee 13 agreed, explaining that “Disaster resilience isn’t just about what you have, but how you use it.” Community emergency resource sharing further aligns with building resilience, adaptation, and sustainable recovery.

The skills in Table 3 thus comprise a structured, multidimensional framework for disaster response that supports individual and community safety, effective communication, informed decisions, and mutual support during emergencies. The skills align with core disaster management principles and seek to contribute to more effective, coordinated, and resilient response strategies.

Basic Skills After a Disaster

Basic post-disaster skills include practical, cognitive, social, and adaptive elements, helping individuals and communities recover and rebuild more effectively (Table 4). These skills align with key recovery themes, including health and sanitation, financial and legal aid, psychological resilience, and disaster-resistant planning. Post-disaster skills cover both short-term recovery (debris clearance, aid application) and long-term resilience (mental health support, disaster resilience planning). Including mental health and physical recovery strategies highlights the importance of holistic disaster management. Integrating digital financial literacy (e.g., online aid applications, digital documentation, insurance claims processing) strengthens financial recovery and relief processes, while encouraging public-private partnerships in resilience planning can accelerate rebuilding efforts.

Table 4. Basic skills after a disaster

Skills Category	Skill Type	Individual Skills	Community Skills
Practical	Debris Clearance & Safety	Safely clearing the property	Coordinated disaster cleanup operations
	Health & Sanitation	Ensuring access to clean water and medical care	Public health and sanitation initiatives
Cognitive	Applying for Aid & Assistance	Navigating financial aid and recovery processes	Recovery coordination efforts
	Learning from the Disaster	Evaluating preparedness effectiveness	Government disaster mitigation



Skills Category	Skill Type	Individual Skills	Community Skills
Social	Rebuilding Community Networks	Providing emotional and material support	Long-term recovery collaboration
	Public Resilience Initiatives	Engaging in reconstruction	Government and NGO rebuilding programs
Adaptive	Mental Health Recovery	Addressing post-traumatic stress	Psychological rehabilitation
	Disaster-Resistant Planning	Reinforcing safety measures	Developing disaster-resilient infrastructure

Practical skills prioritize physical safety, health, and environmental cleanup, supporting a stable disaster recovery process reflected in the DLCS practical skills. Clearing personal property aligns with safe debris removal and infrastructure assessment to mitigate secondary hazards, as articulated by Interviewee 3: “People often don’t realize that unstable structures and residual hazards can be just as dangerous as the disaster itself.” Coordinated cleanup operations strengthen community participation and social support, enabling faster recovery and the restoration of essential services, as described by Interviewee 7: “Community-led cleanup operations work best when local authorities provide coordination and proper disposal mechanisms to prevent secondary health risks.”

Clean water and medical care are critical for hygiene, sanitation, and disease prevention, reducing the risk of post-disaster health hazards. Interviewee 4 underscored this importance: “Many people forget that water sources can become contaminated, increasing post-disaster disease risks.” Public health and sanitation initiatives help prevent concomitant or cascading hazards by strengthening resource management and relief navigation. As Interviewee 11 described: “Public sanitation initiatives must be prioritized in disaster recovery plans. Otherwise, secondary outbreaks like cholera or respiratory infections can spread rapidly.”

Cognitive skills focus on analyzing past experiences, securing financial recovery, and improving future preparedness. Therefore, DLCS cognitive skills include navigating recovery processes, evaluating lessons learned, and preparing for future disasters. The skills align with the financial and legal recovery theme, allowing individuals to access insurance claims, government assistance, and NGO programs. Lacking these skills poses problems for affected persons, as discussed by Interviewee 2: “Many survivors struggle with navigating financial aid processes. The complexity of forms and documentation requirements can make it overwhelming, especially for those who have lost personal records.” Community-level recovery coordination enhances resource management and relief navigation to foster equitable and efficient aid distribution, as shared by Interviewee 9: “Community coordination in aid applications is crucial. Collective advocacy often leads to better distribution of recovery funds and assistance.”

Assessing personal preparedness effectiveness strengthens disaster learning and future preparedness, helping individuals update emergency plans and strategies. Interviewee 5 pointed to this value: “A critical part of recovery is evaluating what worked and what didn’t. Personal preparedness assessments allow individuals to refine their emergency plans.” Government mitigation improvements strengthen post-disaster reflection by enabling authorities to implement better disaster response policies at the community level, as Interviewee 14 asserted: “Governments must integrate disaster lessons into future mitigation efforts. Otherwise, we risk repeating the same mistakes in the next crisis.”

Social skills underscore the importance of collective action for rebuilding infrastructure and restoring normalcy, particularly among vulnerable populations. DLCS social skills emphasize community collaboration, rebuilding efforts, and long-term resilience. Providing emotional and material support aligns with themes of community engagement and social support, equipping individuals to support one another in recovery. As Interviewee 6 explained, “Emotional and material support from the community is essential for recovery. People need to feel a sense of normalcy and security to rebuild effectively.” Long-term collaboration enhances community-based recovery programs, helping increase sustainability and inclusivity in rebuilding efforts. Interviewee 12 expanded on this: “Long-term recovery is only possible through collaboration.”

Participating in rebuilding efforts contributes to infrastructure rehabilitation and physical recovery while simultaneously empowering communities and facilitating mitigation. Interviewee 8



explained how “Disaster reconstruction isn't just about infrastructure. Psychological resilience and social cohesion are equally important for long-term recovery.” Government and NGO reconstruction, retrofitting, and sustainable land-use programs support mitigation and community development, highlighted by Interviewee 10: “Government and NGO rebuilding programs must prioritize disaster-resistant infrastructure. Reconstructing in the same vulnerable ways leads to repeated losses.”

Adaptive skills engender psychological stability and more robust planning and resilience. DLCS adaptive skills focus on mental health, long-term safety, and strengthening disaster-resistant strategies. Addressing post-traumatic stress aligns with psychological and emotional support, equipping individuals to cope with trauma and fostering mental health recovery effectively. Interviewee 1 expressed that “Without mental health interventions, recovery remains incomplete.” Community-led psychological rehabilitation strengthens societal recovery by providing access to counseling and social reintegration support, which “help survivors process trauma and regain a sense of agency” (Interviewee 15).

Strengthening personal safety measures equips individuals to improve preparedness strategies and disaster learning. Interviewee 13 explained: “Reinforcing personal safety measures after a disaster should become standard practice. People should view preparedness as an ongoing process, not a one-time action.” Developing disaster-resistant infrastructure promotes risk reduction, emphasized by Interviewee 17: “Developing disaster-resilient infrastructure must be a policy priority. Climate change is increasing disaster risks, and we need proactive planning rather than reactive rebuilding.”

Basic post-disaster skills must comprehensively address issues of infrastructure, health, financial, and social recovery to help individuals and communities rebuild stronger, recover efficiently, and reduce risks. This is illustrated across the practical, cognitive, social, and adaptive dimensions outlined in Table 4.

Basic Search and Rescue Skills

Basic SAR skills can also be mapped into practical, cognitive, social, and adaptive dimensions to facilitate efficient, coordinated, and safe rescue operations during and after disasters (Table 5). The classification aligns with best practices in emergency response, medical assistance, hazard assessment, and psychological support.

Table 5. Basic search and rescue skills

Category	Skill Type	Individual Skills	Community Skills
Practical Skills	Medical Response & First Aid	Stabilizing victims until help arrives	Emergency medical response teams
	Navigating Hazardous Areas	Safely moving through debris, unstable structures	Coordinated SAR teams
	Victim Extraction	Safely removing trapped individuals	Organized rescue operations
Cognitive Skills	Assessing Danger & Risks	Recognizing unstable structures, hazards	SAR risk assessment strategies
	Strategic Search Methods	Using effective search patterns	Developing SAR operational protocols
Social Skills	Team Coordination	Communicating effectively with other rescuers	Inter-agency rescue collaboration
	Public Engagement in SAR	Teaching civilians how to assist safely	Community disaster response training
Adaptive Skills	Psychological First Aid	Providing emotional support to victims	Crisis counseling services
	Resourceful Rescue Adaptation	Modifying rescue approaches based on conditions	Developing improved SAR techniques



SAR prioritizes hazard awareness and risk assessment to help rescuers operate safely without additional loss of life. The integration of team coordination and inter-agency collaboration underscores the need for efficient communication. When addressing search strategies and hazard assessment, integrating digital mapping tools, drones, and AI-based victim-detection systems may enhance SAR effectiveness. Providing emotional support to victims is included, as is responder mental health to prevent long-term psychological distress and burnout. When addressing the community, greater emphasis on accessible SAR training programs for citizens, schools, and workplaces enhances disaster response capacity.

Practical SAR skills emphasize safe movement, medical care, and effective victim extrication to help save lives with minimal additional risk, expressed in DLCS with hands-on, technical skills that benefit SAR operations. The existence and timeliness of such skills are essential, as characterized by Interviewee 3: “The first minutes after an injury are critical. Bystanders who know basic trauma care can significantly increase survival rates before professional responders arrive.” Interviewee 8 adds that “Many people assume that rescue teams will reach them quickly, but in large-scale disasters, immediate medical response often falls on those nearby.” Thus, prompt attention and immobilizing victims until aid arrives helps reduce injury and mortality. Emergency medical responders contribute to community-level coordination by supporting larger-scale medical assistance.

Safely navigating debris and unstable terrain is important for avoiding injuries, as “inexperienced rescuers risk worsening injuries while trying to pull victims from debris” (Interviewee 2). Coordinated SAR teams enhance search and safety protocols to ensure that teams follow structured search patterns: “Coordinated rescue operations reduce chaos at disaster sites. A structured approach to victim extraction improves efficiency and safety” (Interviewee 15). Safely extricating trapped persons helps rescue survivors without additional harm. Interviewee 12 reinforces this, noting that “A single misstep can put both rescuers and victims in greater danger.” Organized rescue operations further ensure effective extrication for mass casualty response.

Using search patterns is consistent with efficient SAR and victim recovery techniques, enabling systematic searches: “systematic search patterns are crucial—uncoordinated searches waste time and resources, especially in collapsed structures” (Interviewee 6). Developing SAR operational protocols supports coordinated rescue efforts by ensuring standard procedures are followed, as explained by Interviewee 14: “Drones and AI-assisted mapping can improve search efficiency, but basic ground-level search skills remain essential.”

Cognitive SAR skills equip rescuers to analyze risks, follow protocols and best practices, and make informed decisions in dynamic situations. These are reflected in DLCS skills through critical thinking, hazard assessment, and decision-making, as summarized by Interviewee 4: “The ability to assess hazards in real-time is as important as physical strength in SAR. A wrong decision can lead to casualties among rescuers.” Recognizing unstable structures and emerging hazards is vital to risk assessment and abatement. SAR risk assessment strategies strengthen community hazard mapping to ensure teams are aware of environmental risks. Moreover, these skills bridge the pre-, peri-, and post-disaster phases, as Interviewee 11 articulated: “Pre-disaster risk mapping and hazard assessments should be standard practice. Knowing the structural risks of an area before a disaster strikes can save lives.”

Social SAR skills enhance communication, collaboration, and public participation, supporting a well-coordinated community response. DLCS social skills focus on team versions of these SAR skills. Communicating effectively with other rescuers promotes operational efficiency and safety, emphasized by Interviewee 10: “Without seamless integration, different teams often work at cross-purposes, slowing down the rescue effort.” Interagency collaboration strengthens multi-agency response and rescue networks, enabling different actors to work expeditiously together. Such efforts are particularly important in high-stress contexts when “clear communication among rescuers prevents duplication of efforts and ensures maximum efficiency” (Interviewee 1).

Training civilians to assist with SAR safely aligns with community participation and social support to reduce risk. As Interviewee 17 explains, “People often want to help but don’t know how. Public SAR training ensures that well-meaning volunteers don’t create additional risks during rescues.” Interviewee 7 adds, “Educating civilians on basic SAR techniques before a disaster increases survival rates. Trained community volunteers can assist professional teams during large-scale events.” Community disaster response training contributes to citizen SAR participation, enabling local populations to support official responders.

Adaptive SAR skills enhance overall SAR effectiveness by fostering emotional stability, problem-solving, and continuous improvement of rescue techniques. DLCS adaptive skills equip rescuers to adapt to unpredictable circumstances and emotionally support survivors. Providing emotional support to victims is consistent with psychological first aid and victim stabilization to help individuals feel safe and comfortable. Crisis counseling services contribute to post-traumatic recovery and long-term support for both survivors



and responders: “Emotional support is just as important as physical rescue. Survivors are often in shock, and how they are treated in those first moments can shape their long-term recovery.” (Interviewee 9) and “Many SAR personnel suffer from emotional distress after rescues. Psychological support for rescuers should be standard practice, not an afterthought.” (Interviewee 16).

Modifying rescue approaches to the situational context supports improvisational problem-solving and flexibility in rescue. Interviewee 13 contends that “Disaster conditions change constantly. SAR teams must be able to improvise with available resources when standard tools and techniques aren’t viable.” The development of improved SAR techniques strengthens innovative response and allows rescue methods to evolve based on experiential knowledge, illustrated by Interviewee 18: “Rescue methods must evolve based on past experiences. Every disaster teaches new lessons about what works and what doesn’t.”

Discussion

The DLCS framework represents a shift forward in disaster literacy—relative to demonstrated research gaps—moving beyond one-dimensional, knowledge-based approaches to offer a structure that is: (1) skill-based, applicable, and measurable; (2) extensible at individual and community levels; and (3) integrates psychosocial support and digital competencies. DLCS explicitly interweaves two group types (individual and community), four skill categories (practical, cognitive, social, adaptive), three temporal scales (before, during, and after disasters), and two broader categories that exist outside of these temporal scales (basic preparedness skills and SAR skills) (see Supplemental Material 2). The multidimensionality and temporality of the DLCS framework highlight the sheer complexity of the basic disaster competencies articulated by the interviewees. Societies must possess essential knowledge and skills that support the physical, social, and emotional management of disasters across several dynamic and overlapping time periods. Individuals must navigate independently before professional help arrives, working with their community to increase survival, offer aid, and cope mentally and emotionally with the crisis’s impacts.

The DLCS framework distinguishes between professional and non-professional disaster skills, categorizing them by phase and use. Such a classification outlines training priorities to make knowledge and skill acquisition more approachable. Rather than simply instructing people to improve their disaster-related skills, DLCS presents a scaffolded arrangement of interrelated practical, cognitive, social, and adaptive skills compartmentalized over time for individuals and societies. DLCS also helps experts (e.g., researchers, practitioners, policymakers) better understand knowledge and skill boundaries, enabling them to develop tailored content when working with the public to prioritize specific skills or outcomes. Training and disaster literacy are enhanced when experts can target and support what is actually needed, versus including content indiscriminately or repeating what is already known. By breaking down essential skills, practitioners and scholars can better identify skill gaps in specific areas and groups, enabling specialized training. This aligns with globally recognized approaches such as the Sendai Framework for Disaster Risk Reduction, which seeks to formulate effective place-based policies and programs to reduce risk and increase resilience.

However, the training, equipment, and resources required for disaster preparedness may exceed individuals’ financial capacity (Kapucu & Garayev, 2011). In this regard, equity in funding and access are critical for spreading disaster literacy. For example, many training modules, such as FEMA’s CERT program and content on the United Nations Office for Disaster Risk Reduction’s online disaster education platforms, have historically been offered free of charge (FEMA-b, n.d.; UNDRR, n.d.). Publicly supported provision of essential items, such as personal protective equipment (PPE), first-aid kits, and walkie-talkies, will increase volunteers’ effectiveness. Municipalities, NGOs, and local disaster management units can collaborate to organize mass procurement, distribution, and training programs. Additionally, policies that encourage employers to offer disaster training and equipment to their employees could help close resource gaps.

Potential challenges to implementing the DLCS framework and similar instruments must be considered. For example, various resource constraints (e.g., financial, technological, and physical) in low-income settings may limit the deployment and operability of robust disaster literacy programs. These constraints include the availability of space and training resources, the accessibility of services to households and individuals (in terms of transportation, time, and other opportunity costs), and other complex socioeconomic factors. Skill acquisition is also difficult to measure in varied spaces and contexts, particularly in areas with lower literacy rates or access to testing or training facilities. Lack of access to technologies, the digital divide, and issues related to digital literacy raise similar issues for skill acquisition, which are often overrepresented in low-income, under-resourced, rural, and other historically disadvantaged populations.



The DLCS framework could be strengthened by better accounting for cultural contexts, by designing specialized modules, and by conducting psychometric validation of DLCS-based scales. Another limitation is its reliance on U.S.-based expert input, thus requiring piloting in more socio-cultural contexts. Previous research highlights the importance of culturally sensitive (Karacaoğlu & Biamba, 2025) and profession-specific disaster training (Zhang et al., 2024; Farokhzadian et al., 2024). DLCS implementations would benefit from alignments with inclusive digital education models and the integration of profession-based skills modules.

Key Recommendations for Practice and Policy

The DLCS framework seeks to improve individual and community preparedness by enabling experts and professionals to conceptualize disaster literacy more effectively, analyze skill gaps, identify training needs, and formulate appropriate solutions for practice and policy. For recommendations, we first call for greater integration of practical disaster skills into curricula across schools, workplaces, and public programs. Societal disaster awareness requires leveraging these touchpoints. Second, we propose expanding community-based preparedness initiatives, including local emergency response teams and volunteer training. While some trainings may exist, many communities would benefit from expanding these efforts. Third, we recommend increased development of digital and technological tools and training, particularly emergency apps and SAR support tools. Here, too, many tools and assets exist, but more are needed, and they must be made more accessible. Fourth, we suggest promoting psychological first aid, mental health literacy, and financial and insurance literacy as core disaster competencies. Finally, establishing national standards and funding frameworks to develop disaster literacy programs is necessary to support each of these recommendations. With these recommendations, disaster literacy can evolve into actionable skills that empower individuals and communities to reduce risks, respond effectively, and recover efficiently.

Conclusion: Toward a Skills-Based Disaster Literacy Model and a Call to Action

This study contributes to the evolving field of disaster education by presenting a multidimensional, temporally grounded skills-based approach to disaster literacy. Developed from a qualitative analysis of expert interviews, the DLCS framework categorizes core competencies into four domains (practical, cognitive, social, adaptive) based on stages of the disaster management cycle. The findings highlight the need to shift from knowledge-based disaster education to structured, skill-based, and actionable practices that equip communities to respond effectively and recover resiliently. Thus, DLCS emphasizes actionable skills such as first aid, SAR, psychological support, and technological literacy to promote individual and community preparedness. By grounding disaster literacy in real-world competencies, this study provides a foundation to guide curriculum development, educational programs, and policy initiatives.

Author Contributions

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Institutional Review Board Statement

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Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study, the collection, analysis, or interpretation of data, the writing of the manuscript, or the decision to publish the results.

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