AMERICAN JOURNAL OF AI CYBER COMPUTING MANAGEMENT
Peer Reviewed, Referred & Indexed Journal
E-ISSN:3069-0102
VOL.6, NO. 2(1) (2026)

Disaster Preparedness and Response Education System for Schools and Colleges

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***Abstract*—** This research presents a sophisticated AI-driven digital platform designed to overcome the inherent limitations of traditional disaster preparedness training- specifically its lack of interactivity, personalisation, and scalability. By leveraging advanced Natural Language Processing (NLP) techniques, including transformer-based and extractive summarization, the system intelligently synthesis diverse data sources such as PDFs, text files and YouTube transcripts into cohesive, drill-specific summaries. These summaries serves as the foundation for an automated assessment engine that generates unified quizzes, which administrators can further customise with manual questions to ensure comprehensive evaluation. To maximize user engagement and learning retention, the platform features a centralized dashboard where learners can access resources, track performance, and earn badges based on predefined achievement thresholds. A critical component of the system is the "Disaster Assistant", an intelligent conversational agent that provides real- time, content-aware responses to queries regarding cyclone preparedness, emergency response, and risk mitigation. Built with a modular SQLite3 database schema for secure administrative oversight and performance analytics, the platform demonstrates that the integration of AI-driven summarization, automated scoring and real-time assistance significantly strengthens disaster readiness and fosters a more adaptive, accessible educational experience.

Keywords*— *disaster preparedness, AI-driven education, emergency response training, natural language processing, extractive summarization, transformer-based generation, automated assessment generation, disaster assistant.

I. INTRODUCTION

The necessity of disaster preparedness has reached a critical tipping point as the global frequency and severity of natural hazards- ranging from catastrophic cyclones to seismic events- continue to escalate. This highlighted vulnerability is largely a byproduct of rapid urbanization and the unpredictable nature of climate variability. Moving beyond traditional methods, AI now serves aas a cornerstone for enhancing predictive modeling, and streamlining the complex coordination required during high-stakes emergency responses [1]. Modern resilience strategies now rely heavily on the integration of smart technologies within both schools and communities [2]. In high-risk zones, AI is proving vital for everything from early hazard detection to the rapid coordination of public health resources [3].

Recent progress in large-scale AI and intelligent frameworks has significantly strengthened capabilities in disaster prevention, mitigation and emergency response [4]. These AI-enabled crisis management solutions optimize decision-making and coordination within smart environments [5]. Beyond tactical operations, AI increasingly supports preparedness education and trauma-informed awareness initiatives [6]. By leveraging intelligent support systems, organizations can refine disaster planning and data dissemination [7]. Ultimately, these AI-driven coordination mechanisms ensure more precise resource allocation and superior situational awareness during critical emergencies [8].

Recent innovations in AI-driven emergency planning highlight the necessity for systematic, technology-supported platforms that foster continuous user engagement [9]. While cloud-based collaborative environments have proven effective in scaling preparedness and knowledge sharing [10], a critical need remains for structured, interactive spaces that consolidate fragmented data into organised learning modules. To address this, the current study establishes an AI-enabled educational environment. By integrating structured content, interactive assessments, and intelligent conversational assistance, this platform seeks to enhance awareness and resilience across diverse user groups.

II. RELATED WORK

Jiang, Shen, and Chen [11] developed an AI-driven teaching assistant for disaster medicine, emphasizing adaptive learning, automated evaluation and personalized feedback. Their work demonstrates how AI monitors learner progress to dynamically tailor educational content. Similarly, Lakshmi et al. [12] focused on real-time emergency management, integrating AI algorithms with communication infrastructure to streamline response coordination. Together, these studies highlight the critical role of real-time analytics and intelligent decision-support tools in strengthening disaster preparedness and response capabilities.

Xu, Jayakumar Nair, and Waller [13] Bhimavarapu [15] proposed an intelligent disaster management framework which focused on reducing response time using AI-enabled automation and smart routing strategies. The study illuminated how optimization techniques and real-time data processing can expand emergency interventions and improve operational efficiency. Singh and Manoharan [16] explore how integrating AI within smart city frameworks can significantly bolster disaster resilience. Their research highlights the synergy between sensor networks and data fusion, illustrating how urban digital infrastructure supports proactive preparedness and coordinated emergency management.

Abid et al. [17] demonstrate how AI-driven crowdsourcing and social media analytics can significantly bolster community resilience by using natural language processing to extract vital data and improve situational awareness during a crisis. Complementing this approach, Kurnaz and Tekin [18] show that integrating predictive analytics into early warning systems for seismic events leads to more effective alert dissemination and proactive preparedness planning. Together, these studies highlight the critical role of real-time data processing and intelligent monitoring in reducing the overall impact of major disasters.

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Kolivand et al. [19] conducted a scoping review of AI in disaster governance, focusing on a health-centered strategy that integrates predictive analytics and health surveillance with decision-support systems. Their findings emphasizes AI's capacity to bridge the gap between public health authorities and emergency management agencies.Similarly, Faizatiwahida and Andani [20] explored the impact of digital technologies on emergency response, noting that integrated platforms and robust information management tools are essential for improving operational effectiveness.

Collectively, these studies illustrate impressive progress in using AI for disaster prediction, response coordination, governance, and specialized training. However, while much of the current research focuses on high-level prediction models and smart city infrastructures, there has been surprisingly little focus on comprehensive, AI-powered educational platforms. Specifically, there is a lack of unified digital environments that integrate structured learning with adaptive assessments and continuous performance monitoring. This oversight reveals a clear need for intelligent educational systems designed specifically to build long-term community resilience and practical disaster preparedness knowledge.

III. MATERIALS AND METHODS

The AI-driven web application proposed in this study aligns with current trends in both intelligent disaster management and digital learning. Research shows that virtual, AI-powered platforms are essential for combining real-time support with educational frameworks [21], while structured, tech-enhanced models prove that interactive systems are necessary for effective preparedness [22]. The use of generative AI specifically highlights how intelligent assistants can provide contextual guidance while keeping users engaged [23]. Furthermore, integrating AI and machine learning (ML) within GIS and digital frameworks has proven vital for building proactive awareness and systemic resilience [24]. Similarly, AI-driven social media analytics demonstrate how automated data processing can refine situational awareness and overall readiness [25]. By building on these foundations, our platform combines AI summarization, automated assessments, and a conversational assistant to create a comprehensive, learner-centered environment for disaster preparedness.

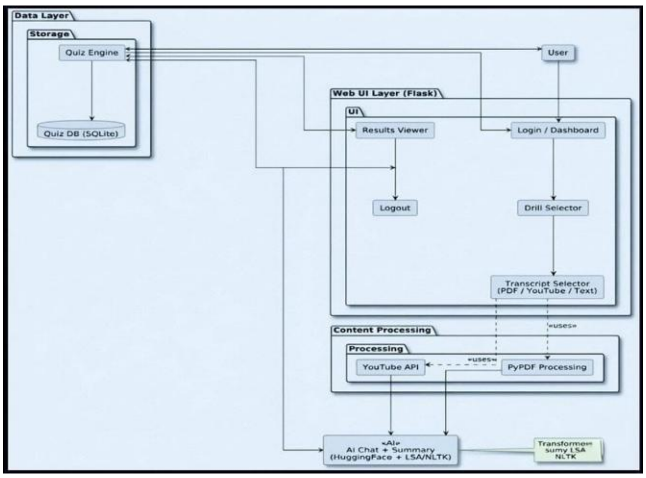

Fig.1 System Architecture

Fig. 1 illustrates that the system is designed using a layered architecture to keep its functions well organised and efficient. The data layer manages storage through a quiz engine connected to a SQLite database, where questions, responses and results are maintained. The UI, built with Flask, allows users to log in, access their dashboard, select drills, and view results, while also enabling them to choose learning content from PDFs, text, or videos. The content processing layer handles the extraction of data using tools like the YT API and PyPDF. This processed data is then used by an AI component, which generates summaries and answers user queries, making the learning process more interactive and easy to understand.

A) Data Acquisition and Content Aggregation:

The initial phase of the methodology focuses on systematic data acquisition from various educational formats tailored to specific disaster drills. Administrators populate the system by uploading PDF documents, TXT files, and raw text, alongside curated video links from which transcripts are harvested. To ensure high data quality, PDF files are processed through a specialized extraction library that isolates machine-readable text while filtering out formatting noise. Similarly, multimedia resources are integrated by converting video transcripts into a purely textual format, allowing diverse content types to contribute equally to the learning material.This extracted data is then consolidated into a unified dataset, uniquely mapped to a specific drill identifier within the system's database.

Before moving to the analytical stage, this aggregated text undergoes a rigorous normalization and cleaning process. This step is crucial for eliminating structural inconsistencies, redundant spacing, and non-essential characters. By transforming heterogeneous resource formats into a standardized textual representation, this approach creates a structured corpus ready for advanced NLP. Ultimately, this preparation enables seamless downstream tasks - such as automated summarization and quiz generation - while ensuring that all content remains traceable and isolated at the individual drill level.

B) Text Preprocessing and Natural Language Processing:

Once the data is aggregated, the combined drill content undergoes a systematic prepossessing phase rooted in NLP. This begins with tokenisation, which segments the text into distinct sentences and words to allow for precise lexical and semantic analysis. To sharpen the focus on relevant content, we perform stopword removal, filtering out semantically insignificant terms that would otherwise create noise. Further normalization - such as lowercasing and punctuation filtering- is then applied to ensure absolute consistency across the entire dataset.

These refined preprocessing steps are critical for enhancing the efficiency and accuracy of the subsequent summarization and quiz generation algorithms. By reducing linguistic noise, the system can better isolate meaningful patterns and key disaster preparedness concepts.This cleaned text is temporarily stored to maintain a modular workflow, ensuring that every transformation is both reproducible and optimized for the analytical models. This structured NLP pipeline acts as a vital intermediary,

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transforming raw educational materials into high-quality input that supports reliable, learner-oriented content delivery.

C) AI-Based Summarization Mechanism:

To turn long, complex disaster drills into manageable study guides, we developed a two-part summarization strategy. Our primary method uses abstractive summarization powered by transformer models. Rather than just cutting and pasting sentences, these models actually "read" the text to understand the context, allowing them to rewrite this information into clear, human-like summaries. This is especially helpful for simplifying dense disaster protocols and removing repetitive details that might confuse a learner.

However, since large AI models can sometimes be slow or resource-heavy, we built in a backup: extractive summarisation using Latent Semantic Analysis (LSA). IF the primary model hits a snag, LSA takes over by statistically identifying which sentences in the original text are the most important based on key excerpts, it is automatically saved to the specific drill for the student to review. This hybrid setup makes our platform both reliable and scalable, ensuring students have a concise, easy-to-read roadmap to follow before they start their assessments.

D) Automated Assessment and Performance Evaluation:

The final stage of our methodology involves the transition from passive learning to active assessment through automated quiz generation and performance tracking. To create these assessments, our algorithms parse the drill-specific summaries to pinpoint critical factual statements and specialized terminology. From this data, the system automatically builds objective question formats, including MCQs and true/false options. While the correct answers are pulled directly from the summarized content, "distractor" options are strategically developed using semantically similar terms to ensure questions effectively test a learner's understanding.

These AI-generated questions are then merged with any manually created administrative questions to form a comprehensive final assessment. When a student completes the quiz, the system evaluates their answers via rule-based matching and calculates percentage-based score. Every attempt, including timestamps and specific performance metrics, is logged within the database. To encourage continuous engagement, we implemented a digital badge system; these rewards are triggered once a learner hits a specific achievement threshold, providing a clear visual indicator of their progress through the material.

Ultimately, this methodology ensures that evaluations are both scalable and perfectly aligned with the instructional content, all while maintaining a transparent tracking system. By combining automated assessments with secure data storage and achievement mapping, the platform effectively supports measurable learning outcomes. This allows for the continuous monitoring of how well the user is acquiring and retaining critical disaster preparedness knowledge.

E) Disaster Assistant:

To ensure the Disaster Assistant serves as a high-impact learning tool, we integrated it as an intelligent conversational module capable of providing immediate, real-time support. Rather than requiring users to navigate static documents, this assistant allows for the active inquiries into critical safety topics such as cyclone awareness, evacuation protocols, and emergency kit preparation. By utilizing natural language understanding, the module processes these specific queries to deliver clear, context-free responses that help learners resolve doubts the moment they arise. This transition from passive reading to an interactive dialogue significantly boosts user engagement and comprehension, transforming the platform into an always-available virtual support system. Ultimately, the Disaster Assistant strengthens individual readiness by offering a continuous, accessible and user-friendly digital resource that adapts to practical needs of each learner

IV. EXPERIMENTAL RESULTS

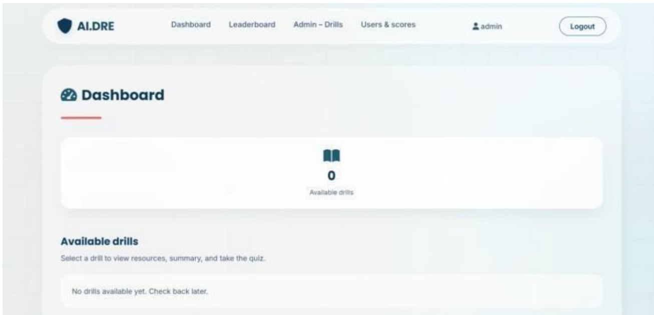

Fig.2 Admin Dashboard

Fig.2 displays the AI.DRE dashboard interface, currently showing zero available drills for the user.

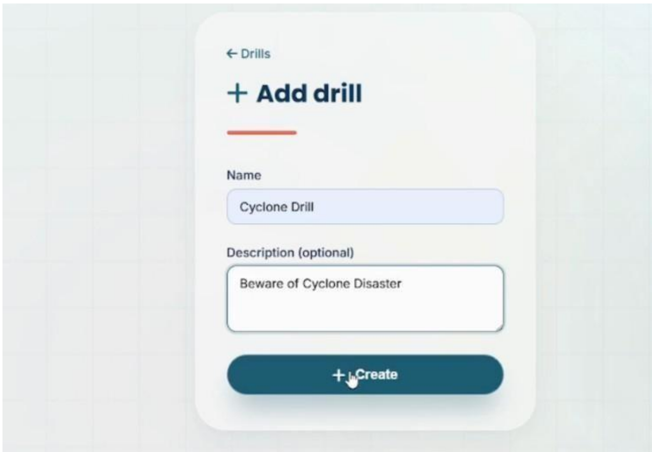

Fig.3 Added Drill

Fig.3 shows the interface for naming and describing a new drill, like the Cyclone Drill.

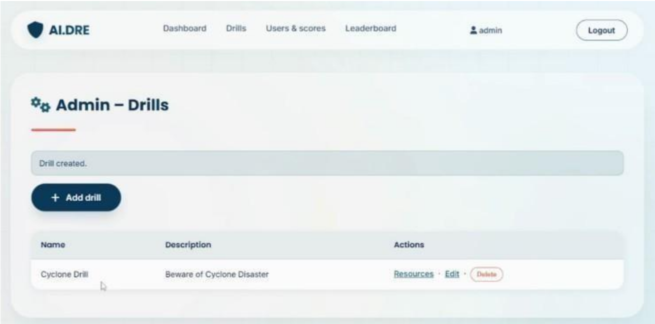

Fig.4 Admin - Drills

Fig.4 confirms the successful creation of the "Cyclone Drill" within the admin management panel.

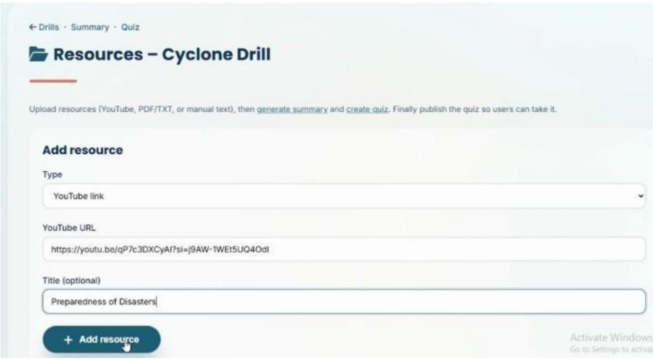

Fig.5 Add Resources

Fig.5 demonstrates adding a YouTube resource titled "Preparedness of Disaster" to the created drill.

Fig.6 Generate Summary

Fig.6 displays the summary generation interface for the Cyclone Drill after adding drill resources.

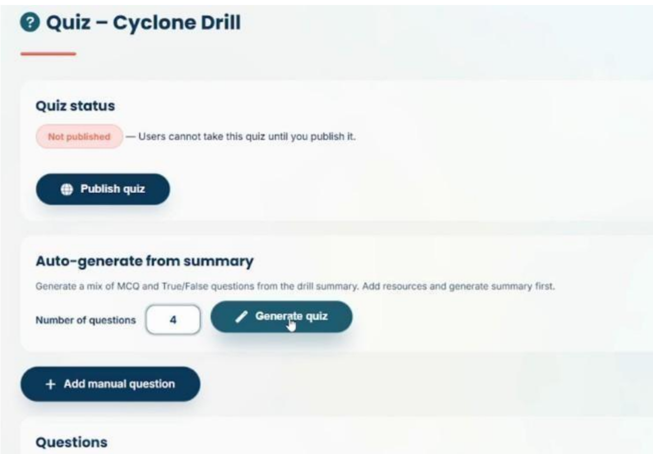

Fig.7 Generate Quiz

Fig.7 displays the quiz generation interface, allowing admins to auto-generate questions from the drill summary.

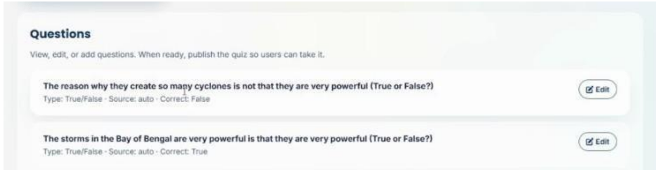

Fig.8 Questions of Quiz Generated

Fig.8 displays the generated quiz questions, which admins can view, edit, or publish for learners.

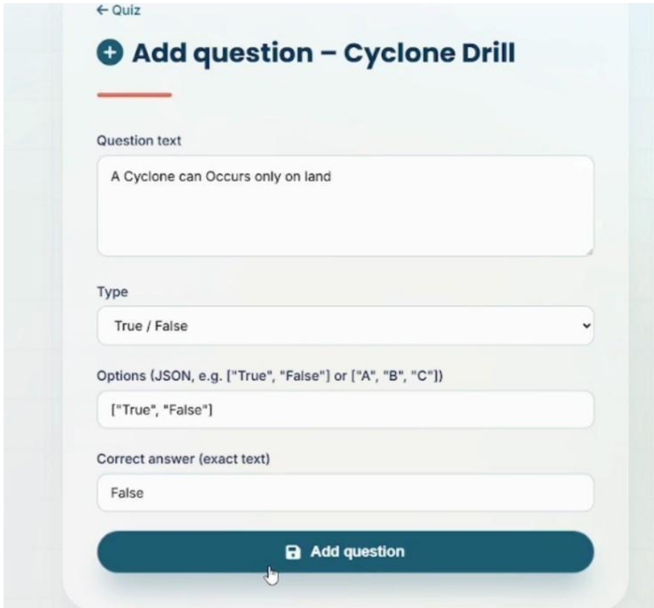

Fig.9 Add Manual Question

Fig.9 shows the manual question entry form, allowing admins to add custom MCQ or True/False items.

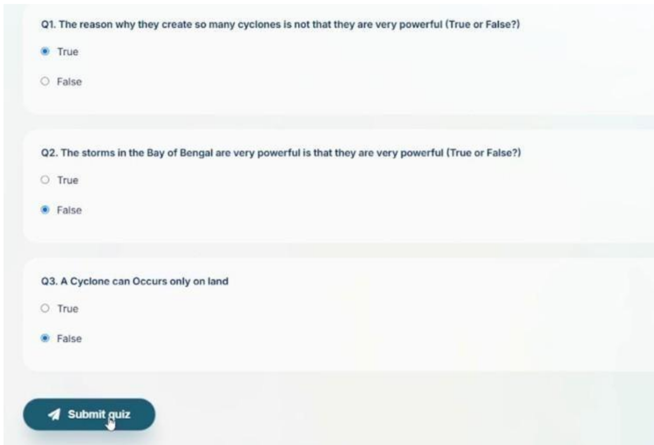

Fig.10 User – Take Drill

Fig.10 presents the learner's active quiz interface for the Cyclone Drill with multiple-choice questions.

Received: 26-03-2026 | Accepted: 05-05-2026 | Published: 12-05-2026 | www.ajaccm.com

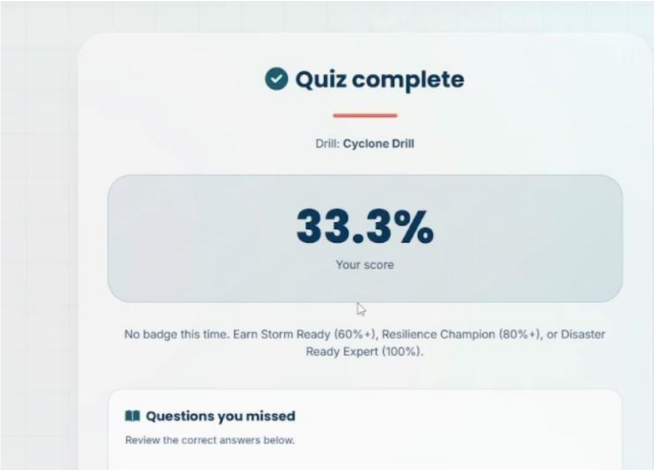

Fig.11 View Marks & Badges

Fig.11 displays a user's performance profile, featuring their quiz score and the earned drill badge.

Fig.12 Admin can View Marks & Badges

Fig. 12 shows an Admin viewing "Username1's" marks and badges for the Cyclone Drill.

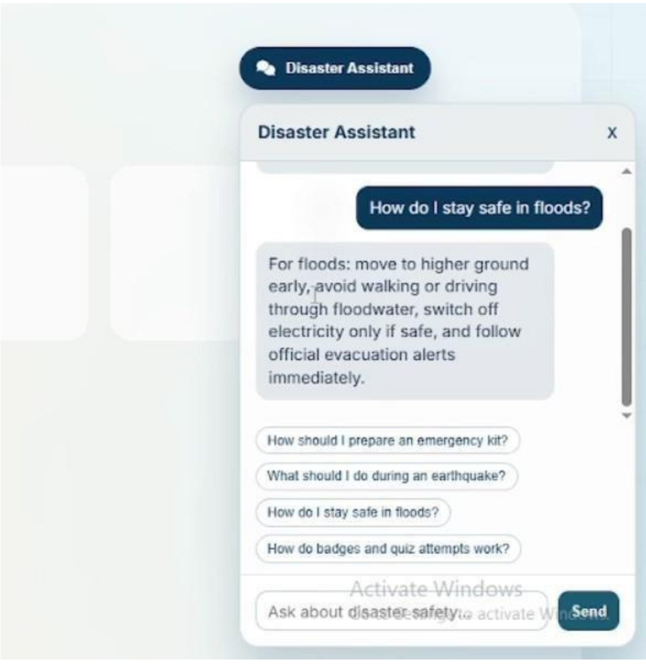

Fig.13 User Can Ask Question to Disaster Assistant

Fig. 13 shows a user receiving flood safety advice after questioning the interactive Disaster Assistant.

V. CONCLUSION

The development of this AI-based disaster preparedness platform proves that intelligent technologies can successfully evolve traditional learning into a highly interactive, user-centered experience. By synthesizing data from diverse sources- including PDFs, text files, and video transcripts- the system creates structured, drill-specific summaries that make complex data more accessible. The integration of automated quiz generation alongside manual oversight ensures a balanced and rigorous assessment of learner comprehension. Furthermore, the platform's role-based access and performance tracking, reinforced by a digital badge system, foster a sense of continuous progress and measurable growth. The Disaster Assistant adds a critical layer of support by offering real-time responses to different disaster-related inquiries, allowing users to resolve doubts instantly and sharpen their situational awareness. Ultimately, by combining secure data management with intelligent interaction, the platform achieves a unified environment for structured knowledge delivery and automated evaluation. These outcomes demonstrate that the strategic use of AI not only streamlines administrative control but also significantly improves learner engagement and knowledge retention in the vital field of disaster education.

Looking ahead, the evolution of this platform could focus on several key strategic expansions to deepen its educational impact and reach. One primary area of development involves transitioning toward a truly adaptive learning model, where the system analyzes individual performance trends to recommend personalized study resources and tailored quizzes. To further bridge the gap between theory and practice, we envision integrating immersive technologies like VR or real-time simulation exercises, allowing users to test their decision-making skills in dynamic environments. Accessibility remains a critical goal; therefore, introducing multi-language support would be essential for reaching a broader, more diverse global population. On the analytical side, future iterations could leverage predictive modeling to gain deeper insights into long-term knowledge retention and evolving risk awareness among different user groups. Furthermore,the platform could shift from an individual focus to a community-based model by incorporating collaborative features such as group drills, moderated discussion forums, and peer-to-peer evaluations. Finally, moving the entire framework to a scalable, cloud-based infrastructure would ensure that the platform can support a growing user base while maintaining rigorous standards for data security and service continuity.

REFERENCES

[1] Upadhyaya, A. N., Debnath, P., Rani, P., Selvakumar, P., Manjunath, T. C., & Bhattacharya, S. (2025). AI-Based Disaster Prediction and Early Warning Systems. In *AI and Emerging Technologies for Emergency Response and Smart Cities* (pp. 55-74). IGI Global Scientific Publishing.

[2] Aldous, S. M., & Ismail, G. A. (2025). AI for Sustainable Emergency Preparedness and Response in Schools. In Convergence of AI, Education, and Business for Sustainability (pp. 51-74). IGI Global Scientific Publishing.

[3] Adiwinoto, R., Prasetya, V., Najmasari, N., Sudarta, J., Putri, F., Garianto, E., ... & Diarsvitri, W. (2025, March). Narrative Review on AI-Driven and Social Media-Enhanced Early Detection, Mitigation, and Public Health Preparedness in Natural Disaster-Prone Areas. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1473, No. 1, p. 012020). IOP Publishing.

[4] Xie, C., Gao, H., Huang, Y., Xue, Z., Xu, C., & Dai, K. (2025). Leveraging the DeepSeek large model: A framework for AI-assisted disaster prevention, mitigation, and emergency response systems. *Earthquake Research Advances*, 100378.

[5] Subrahmanyam, S. (2025). The Role of AI in Crisis Management and Disaster Response. In *Citizen-Centric Artificial Intelligence for Smart Cities* (pp. 227-260). IGI Global Scientific Publishing.

[6] Sorani, M. (2025). The role of artificial intelligence in enhancing disaster preparedness and trauma care. *Journal of Preventive and Complementary Medicine*, *4*(1), 35-44.

[7] Eren, V., & Duman, H. (2025). Artificial intelligence support in disaster management. *Kamu Yönetimi ve Teknoloji Dergisi*, *7*(1), 13-36.

[8] Ocal, F. E., & Torun, S. (2025). Leveraging artificial intelligence for enhanced disaster response coordination. *International Journal of Disaster Risk Management*, *7*(1), 235-246.

[9] Das, R. (2018). Disaster preparedness for better response: Logistics perspectives. *International journal of disaster risk reduction*, *31*, 153-159.

[10] Kumar, S., & Semwal, A. (2025). Artificial intelligence and cloud-based collaborative platforms for managing emergency operations. *Journal of Recent Innovations in Computer Science and Technology*, *2*(2), 49-61.

[11] Jiang, Y., Shen, Y., & Chen, S. (2025, June). Design of Artificial Intelligence based Teaching Assistance System for Online" Basic Disaster Rescue Medicine" Courses. In *2025 International Conference on Intelligent Computing and Knowledge Extraction (ICICKE)* (pp. 1-7). IEEE.

[12] Lakshmi, T. K., Mangalapu, N. K., Swaminathan, M. F. A. J., Chandravadhana, S., Pari, R., & Ranjana, T. (2025, January). AI for Disaster Response: Developing Intelligent Systems for Real-Time Emergency Management. In *2025 International Conference on Next Generation Communication & Information Processing (INCIP)* (pp. 868-874). IEEE.

[13] Sutton, J., & Tierney, K. (2006). Disaster preparedness: Concepts, guidance, and research. *Colorado: University of Colorado*, *3*(1), 3-12.

[14] Alexander, D. E. (2015). Disaster and emergency planning for preparedness, response, and recovery. Oxford University Press.

[15] Bhimavarapu, U. (2026). Smart Disaster Management Minimizing Response Time in Disaster Situations Using AI. In *AI-Driven Policing and Urban Security in Smart Cities* (pp. 245-262). IGI Global Scientific Publishing.

[16] Singh, R., & Manoharan, G. (2025). AI Integration to Strengthen Disaster Resilience in Smart Cities. In *AI and Emerging Technologies for Emergency Response and Smart Cities* (pp. 1-30). IGI Global Scientific Publishing.

[17] Ilo, P. I., Izuagbe, R., Mole, A. J., & Ekwueme, L. social science literature.

[19] Ravisankar, S., Ramachandran, V., & Shankar, S. R. (2025, March). Virtual Disaster Management Systems for Real-Time Response and Aid. In *2025 International Conference on Data Science, Agents & Artificial Intelligence (ICDSAAI)* (pp. 1-5). IEEE.

[20] Collins, M. L., & Kapucu, N. (2008). Early warning systems and disaster preparedness and response in local government. *Disaster Prevention and Management: An International Journal*, *17*(5), 587-600.

[21] Karacaoğlu, Ö. C., Karacaoğlu, D., & Özbaltan, N. (2025, April). Artificial intelligence based solutions in disaster literacy training. In *10th International Conference on Lifelong Education and Leadership for ALL (ICLEL 2024)* (pp. 28-45). Atlantis Press.

[22] Kurnaz, S. Ç., & Tekin, Ö. F. (2025). AI Supported Early Warning Systems in Smart Disaster Management: The Case of Kahramanmaraş Earthquakes. *Pakistan Journal of Life and Social Scienc es (PJLSS)*, 22(

[23] Sudhi, M., Aishwarya, T. R., Shetty, D.K, Balakrishnan, J. M., Ahmad, S., & Sankaran, P. P. (2025). Ai-driven innovations in emergency and disaster response: strategies for effective planning. *Proc Eng Sci*, *7*, 1293-304.

(2018). Measuring disaster preparedness and response practices in university libraries in Nigeria: The role of disaster equipment. *International Journal of Disaster Risk Reduction*, *31*, 85-91.

[18] Tierney, K. J. (1993). Disaster preparedness and response: Research findings and guidance from the