

Research Article

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Communicative Learning in Crisis: How Balinese Local Wisdom Shapes Educational Responses to Mount Agung's Volcanic Threats

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Abstract

Background/purpose. The eruption of Mount Agung in Bali from 2017 to 2019 had a significant impact not only on the island's physical landscape but also on its social structures and educational continuity. This study examines the role of Balinese local wisdom in shaping communicative learning strategies during the volcanic crisis. Specifically, it explores how traditional belief systems, religious practices, and trusted community figures informed disaster education and contributed to local resilience.

Materials/methods. Employing a qualitative case study design, the research focuses on two villages located within Mount Agung's high-risk zone: Amerta Bhuana and Duda Timur. Drawing on symbolic interactionism, communicator ethos, and disaster literacy as conceptual frameworks, data were collected through 21 semi-structured interviews, 22 field-based observations, and analysis of 15 cultural and administrative documents. Participants included religious authorities (Jero Mangku), local officials, community members, and representatives from *Pasebaya Agung*.

Results. The findings reveal that disaster communication in these communities is deeply interwoven with spiritual narratives and cultural symbols. Traditional leaders serve not only as religious guides but also as primary communicators of environmental risk, enhancing trust and motivating community action. Informal learning environments—such as temple ceremonies, village assemblies, and oral traditions—play a central role in transmitting disaster knowledge. This culturally embedded approach fosters a form of disaster literacy that integrates emotional, spiritual, and symbolic understanding with practical awareness.

Conclusion. The study highlights the effectiveness of hybrid communication models that blend scientific information with indigenous knowledge systems. Incorporating culturally meaningful practices into disaster education enhances credibility, promotes sustained community engagement, and strengthens overall preparedness. These findings underscore the importance of culturally responsive approaches in designing disaster education programs for vulnerable regions.



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1. Introduction

The eruption of Mount Agung in the Karangasem Regency of Bali from 2017 to 2019 transcended a mere geological event characterized by physical and material disruption. It represented a multifaceted crisis that encapsulated the intricate interactions among natural phenomena, human society, and cultural dynamics. This volcanic occurrence not only disturbed the earth's crust but also stimulated the collective awareness of Balinese society regarding the crucial roles of social resilience, spirituality, and cultural endurance during times of crisis. Over the course of these two years, Mount Agung demonstrated escalating volcanic activity, evidenced by increased seismic activity, ground deformation, and the release of pyroclastic materials, which posed direct threats to both the environment and the safety of the local population. According to the 2019 statistics provided by BPBD Bali, over one hundred thousand individuals were compelled to evacuate in preparation for a possible devastating volcanic eruption. This emergent situation exerted significant strain on various aspects of societal life, particularly on formal education systems, which experienced considerable disruption due to restrictive mobility, mass relocation efforts, and damage to both physical and social infrastructures.

The economic repercussions of the disaster echoed throughout the region, particularly due to Bali's substantial dependence on tourism, which faced temporary paralysis from airport closures and the cancellation of international events. On a social level, the uncertainties of displacement, conflicting information, and inadequate public services tested the fabric of interpersonal and intercommunal relations. Nonetheless, amidst these adversities, the Balinese populace exhibited extraordinary adaptability. Rather than relying solely on formal government support structures, they harnessed internal resources rooted in local wisdom, community solidarity, and spiritual ethics as survival strategies. Their responses were not merely reactive; instead, they were systematically informed by a cultural consciousness shaped by a long-standing relationship with Mount Agung, which holds significant importance in their belief system.

As discussed in this research, the spiritual principles embedded in Hindu Dharma—especially the concept of *Tri Hita Karana*—serve as a foundational epistemological framework through which Balinese society interprets disasters. This principle underscores the importance of balance and harmony among three realms of existence: the sacred relationship between humans and the divine (*parahyangan*), relations among people (*pawongan*), and interactions with the natural environment (*palemahan*). Within this belief system, natural disasters like the eruption of Mount Agung are perceived not merely as unfortunate events but as expressions of cosmic imbalance that necessitate spiritual reflection and ritualistic practices to restore harmony (Setiawan, 2023). Mount Agung, therefore, is not regarded simply as a geological threat but as a spiritual center—the revered home of Lord Shiva (Mahadewa), who occupies a central position in Balinese Hindu cosmology. Thus, the eruption has been interpreted not as a destructive force, but as a divine admonition or cosmic signal from *Sang Hyang Widhi Wasa*, urging humanity to reestablish balance and ethical living (Bryndin, 2023; DİLEK & KAHYA, 2023).

Consequently, the community's responses to the eruption threat were not shaped solely by directives from formal entities like the National Disaster Management Agency or the Center for Volcanology. Instead, these responses were deeply rooted in cultural and spiritual frameworks that permeate communal consciousness. Decisions regarding evacuation, return, or remaining in situ were influenced not only by technical directives but also by spiritual beliefs mediated by traditional leaders and religious representatives. Interpretations of natural phenomena, prayer rituals, and spiritual communications formed vital components of the community's practical response system. This illustrates the fundamental need for a disaster communication strategy that extends beyond top-down technical approaches, incorporating value systems, cultural symbolism, and the authority of

local actors intertwined with communal experiences. In the Balinese context of disaster, effective communication is not solely informational; it fosters a sense of safety and cultural legitimacy.

The communication practices observed during the disaster highlighted a complex, dynamic, and reciprocal interaction network between formal and informal actors. On one end, there were official bodies, such as the Regional Disaster Management Agency (BPBD), the Center for Volcanology and Geological Hazard Mitigation (PVMBG), and local governmental organizations entrusted with risk management and emergency response authority. Conversely, culturally and spiritually empowered local figures, including *Jero Mangku* (ritual priests), serve as guardians of religious and customary values within everyday Balinese life. The interplay—and sometimes tension—between these two domains—state institutions and the *adat* (customary) community—resulted in a mode of communication that was neither straightforward nor unidirectional, but instead interactive and sensitive to the context. In a societal configuration that honors symbolic legitimacy, *Jero Mangku* acts as cultural communicators who bridge the messages emanating from "nature" with the human quest for protection and guidance.

As traditional figures, *Jero Mangku* are viewed as more than just spiritual leaders; they function as cosmological interpreters believed to have an exceptional connection with nature and Lord Shiva. Consequently, their communications regarding the volcanic activity of Mount Agung are frequently perceived as more credible than those from government institutions. Community members often awaited spiritual indicators from *Jero Mangku* before choosing to evacuate or discerning if a geological occurrence represented a divine caution or a purely technical hazard. In this light, government-issued messages concerning mitigation require communication strategies that resonate with local belief systems to achieve efficacy, not merely through rational or formal analyses, but by aligning with the cultural legitimacy that prevails within those communities (Fakhrudin & Elmada, 2022; Pesavento et al., 2025). Herein lies the importance of the communicator's ethos—illustrating that the effectiveness of communication is significantly influenced by the communicator's credibility, ethical standing, and emotional connection with their audience. The ethos represented by *Jero Mangku* is cultivated through cultural recognition, continuity in spiritual practices, and social proximity—attributes that cannot be easily replicated by modern communication channels, regardless of their sophistication.

Moreover, disaster communication practices founded on local wisdom, particularly demonstrated by the Amerta Bhuana community, underscore that communication models cannot exist independently of cultural context and social structure. In this community, the transmission of disaster preparedness knowledge does not solely depend on official sources or mass media but flows through traditional social mechanisms that fulfill both educational and cohesion roles. Venues such as the *banjar* (village meeting hall), *pura* (temple), and community networks like *Pasebaya Agung* serve as fundamental platforms for disseminating information, fostering collective understanding, and coordinating proactive measures. For example, *Pasebaya Agung* employs community radio and handy talkies as primary means of communication to relay real-time updates to residents spread across vulnerable areas (Syahbana et al., 2019). This approach has proven more effective and reliable than social media channels, which often disseminate panic through misinformation and rumors.

The learning model that emerged in these conditions was not a formal, institutionally directed curriculum; rather, it took the form of communicative learning that is participatory, experiential, and integrated into everyday practices. Individuals of all ages—children, teenagers, and adults—acquired knowledge not from direct instruction by formal educational establishments, but through social interactions, participation in religious events, and observation of natural signs interpreted across generations. Awareness of disaster risks, early warning signs, and evacuation plans were cultivated through active involvement in rituals and customary practices, as well as through engagement with traditional texts such as the *lontar*, which are believed to transmit teachings about cosmic equilibrium

and the human-nature connection (Gelgel et al., 2024; Nekada & Manuaba, 2021). As such, disaster literacy in the Balinese context develops into a type of knowledge that is not exclusively cognitive, but encompasses spiritual, emotional, and symbolic dimensions.

Although previous studies have examined disaster response in Indonesia from sociological and logistical perspectives, few have addressed the symbolic, communicative, and culturally constructed learning mechanisms that emerge organically from within local communities during crises. This represents a significant research gap, particularly in how indigenous knowledge systems shape disaster literacy and resilience, not merely through information, but through symbolic interaction, spiritual belief, and participatory communication. Accordingly, this study seeks to fill that gap by examining communicative learning as a culturally embedded educational process, one that combines traditional epistemologies with disaster awareness.

This study conceptualizes learning during crises not merely as a cognitive process but as a social and cultural practice that integrates scientific insights with indigenous wisdom. The framework of symbolic interactionism theory (Efendi et al., 2024) assists in exploring how meanings surrounding disasters are constructed through social interactions and symbolic interpretations. Concurrently, disaster literacy theory (Brown et al., 2014; Karabey & Aygün, 2022) offers a conceptual lens for examining how communities obtain, process, and apply information in ways that are contextually relevant to enhance their disaster response capabilities. In this scenario, literacy is not a neutral construct; it is a culturally embedded practice rich with significance. Indeed, literacy becomes a medium for transmitting local knowledge across generations, solidifying identity and promoting collective resilience in the face of crises (Ningrum et al., 2023; Pedersen & Kaarhus, 2023).

In the context of this complex backdrop, the current research aims to explore how communication-based learning practices, influenced by Balinese traditional wisdom, are enacted considering the volcanic risks posed by Mount Agung. This inquiry extends beyond merely relaying information; it seeks to examine how culturally rooted knowledge systems shape educational practices and bolster community resilience during emergencies. The study is structured around three primary aims: (1) to pinpoint the strategies used to circulate disaster-related information regarding the Mount Agung eruption within the Amerta Bhuana community, leveraging communication methods informed by local culture; (2) to classify the various types of disaster literacy fostered among residents as part of an educational system deeply intertwined with traditional values and local knowledge; and (3) to clarify the disaster communication behaviors exhibited by different stakeholders—such as government entities, community leaders, and grassroots organizations—to enhance community resilience, promote knowledge sharing, and strengthen preparedness initiatives in times of elevated risk.

By focusing on Bali's distinct socio-cultural landscape, characterized by a cohesive spiritual perspective and a profound respect for nature, this study aims to contribute both empirically and theoretically to the wider dialogue surrounding disaster education. It highlights the importance of intercultural teaching methods, community involvement, and indigenous communication channels in forming adaptive responses to environmental crises. Through this approach, the study showcases Balinese experience as a significant example of how local knowledge can be utilized as a strategic asset for educational strategies in emergencies.

The community's reaction to the Mount Agung eruption, as witnessed in Amerta Bhuana, represents a dynamic and interactive model of learning that goes beyond formal education settings. It emphasizes the ability of indigenous knowledge frameworks to function as effective tools for risk communication, emotional resilience, and adaptive behaviors. This model of education—which merges ritual practices, oral traditions, collective decision-making, and spiritual contemplation—proposes an alternative to conventional, hierarchical disaster education methods. Consequently, the

outcomes of this research align with the increasing advocacy within global educational and development literature for more contextually aware, culturally relevant, and participatory strategies for learning, particularly in regions vulnerable to disasters.

In an age marked by environmental instability, societal fragmentation, and global unpredictability, the knowledge produced by this research not only reinforces the epistemic authority of local wisdom in disaster scenarios but also promotes its inclusion in modern educational discussions and practices. Viewed from this perspective, Balinese communicative learning during crises emerges as both an educational response and a cultural strategy—one that affirms identity, fosters community solidarity, and sustains collective well-being in the face of challenges.

2. Literature Review

Contemporary research underscores the significant contribution of local wisdom in enhancing disaster risk reduction (DRR) strategies, extending beyond structural methodologies to encompass cultural practices, participatory communication, and community-driven education. A study conducted by Hastuti and Sadeli (2024), titled *“Local Wisdom in Disaster Mitigation Education: Stilt Houses in Various Regions of Indonesia”*, elucidates the role of traditional stilt house architecture—prevalent in areas vulnerable to disasters such as Aceh and Kalimantan—not merely as a cultural symbol but as an educational mechanism for disaster mitigation interwoven into the fabric of community life. The researchers conclude that these indigenous values can serve as a basis for developing disaster education curricula in schools that are both contextually relevant and operationally practical.

Simultaneously, Putri et al. (2024), in their exploration of the *Kasepuhan Ciptagelar* indigenous community, highlight the essential nature of local belief systems, customary restrictions, and social organizations in adapting to disaster risks. Their article, *“Disaster Mitigation Based on Local Wisdom in the Indigenous Community of Kasepuhan Ciptagelar”*, demonstrates that agricultural practices, land utilization, and forestry conservation are not merely ecological matters but are embedded within a broader continuum of collective knowledge that spans generations. Additionally, community leaders play a crucial role in imparting disaster-related values through collective activities such as traditional gatherings and rituals, which concurrently serve as platforms for educational engagement within the community.

Further analysis by Andreastuti et al. (2023), presented in their article *“Volcano Disaster Risk Management During Crisis: Implementation of Risk Communication in Indonesia”*, emphasizes the critical role of effective risk communication in addressing volcanic disasters in Indonesia, especially amidst crises. Their findings indicate that community-centered risk communication rooted in local comprehension is vital for disaster mitigation. They identify that communication methods, including social media and community assemblies, can enhance public responsiveness to looming disasters while alleviating undue anxiety. This perspective reinforces the value of local wisdom in fortifying early warning systems and enhancing community preparedness. Andreastuti et al. (2023) assert that risk communication in Indonesia necessitates collaborative efforts among scientific authorities, government bodies, and local populations. By employing inclusive and participatory approaches, community members are more likely to engage in the planning and decision-making processes, which significantly enhances their preparedness and capacity for active involvement in risk reduction initiatives.

At a global level, a recent investigation by Firdaus et al. (2023), published in *Jàmbá: Journal of Disaster Risk Studies* and titled *“Integrating Local and Indigenous Knowledge Systems in Disaster Risk Reduction: The Case of Mount Anak Krakatau, Indonesia”*, examines the influence of local knowledge systems in coastal communities surrounding Mount Anak Krakatau on risk perceptions and survival strategies. The research indicates that community members depend on environmental cues—such

as variations in sea currents, soil temperature, and animal behavior—as preliminary indicators of disasters. These locally recognized warning systems complement scientific methodologies and bolster social resilience, particularly when conveyed by respected informal figures like senior fishermen and religious leaders.

Additionally, Gómez and Bergua (2024) engage in an ethical and deliberative discourse on disaster responses in their article *“Intercultural and Deliberative Disaster Ethics: Insights from the Mount Pinatubo Eruption”*, published in *Philosophies*. Their study explores the ethical dimensions of communication within the context of the Aeta Indigenous community in the Philippines following the eruption of Mount Pinatubo. The authors propose the notion of *“intercultural deliberation”* as an approach to crisis communication that emphasizes the importance not only of timely information dissemination but also of creating participatory environments where Indigenous communities can interpret disasters within their cosmological understandings and shared experiences. In this regard, disaster learning transpires through informal gatherings, religious ceremonies, and communal reflections, thereby fostering responses that are both respectful and deeply ingrained in local traditions.

Collectively, these five studies affirm that the success of disaster risk reduction strategies is intrinsically linked to the acknowledgment and incorporation of local wisdom as both a repository of knowledge and a foundation for ethical considerations. However, there remains a predominance in existing research focusing on structural dimensions—such as the influence of customary leaders or ecological adaptation strategies—while the communicative learning processes in disaster contexts, especially those of an interactive, symbolic, and spiritual nature, have not yet been comprehensively explored.

Considering this identified research gap, the current study aims to investigate how Balinese communities, particularly those residing in proximity to Mount Agung, engage in communicative learning practices grounded in local wisdom during periods of volcanic eruptions. This research promises to offer a fresh perspective by integrating the facets of crisis communication, participatory education, and local spirituality as vital components of community responses to disaster threats that remain relatively underexamined in the existing literature. The anticipated findings aim to enrich academic discourse on disaster education by advocating for a more contextualized, human-centered, and community-oriented approach.

At a theoretical level, this research establishes its conceptual framework through the integration of three principal perspectives: *Symbolic Interactionism Theory*, *Communicator Ethos Theory*, and *Literacy Theory*. *Symbolic Interactionism Theory* (Efendi et al., 2024) highlights the essential role of symbols in the processes of social communication and the way meaning is derived through interpersonal interactions. In relation to disasters, the understanding of the Mount Agung eruption is influenced not only by scientific explanations but also by interpretations shaped by religious and cultural symbols, formed through the interactions within the community.

Communicator Ethos Theory suggests that the success of message transmission is closely linked to the perceived credibility, ethical standing, and trustworthiness of the communicator (Hasmawati, 2020). Within the Balinese setting, individuals such as *Jero Mangku* (traditional priests) or village leaders are identified as primary communicators who are regarded with high ethical standards by the local population. Their spiritual authority allows their messages to be perceived as more than mere information; they are received as significant guidance that is profoundly integrated into the community's behavioral responses.

Additionally, the literacy perspective is applied to analyze how the community engages in disaster-related learning in a manner that is both participatory and tailored to their specific context. Referring to the work of Brown et al. (2014) and Karabey & Aygün (2022), literacy is viewed not only

as a technical ability but as a practice that is situated socially and is shaped by cultural circumstances, power dynamics, and symbolic associations. In this context, disaster literacy refers to the community's ability to identify environmental indicators, interpret relevant information, and respond appropriately according to traditional values and shared experiences.

This research positions disaster communication as a socially constructed phenomenon that affects how communities perceive and respond to disasters. The study explores key themes, including disaster communication, environmental communication, disaster mitigation, indigenous knowledge, opinion leadership, and disaster literacy. The notion of disaster communication transcends the simple dissemination of information during crises; rather, it underscores the dynamic interaction between communities and the messages conveyed through both formal and informal networks, which in turn are influenced by cultural contexts, trust levels, and symbolic meanings. Environmental communication complements this framework, particularly within Indigenous communities like Bali, where the environment is regarded as both ecological and spiritual. From this standpoint, natural events are seen as interconnected with a universal order, with each occurrence imparting important messages to humanity, thus blending cultural, religious, and ecological perspectives into a comprehensive understanding of disasters.

In this context, disaster mitigation is framed as a priority for enhancing community resilience through educational, social, and cultural strategies, rather than merely relying on technical solutions. It emphasizes the significance of collaborative efforts that engage established institutions alongside local communities, thereby reducing vulnerability to disasters. By integrating indigenous knowledge and participatory approaches, disaster mitigation evolves into a shared responsibility, empowering individuals and groups to take proactive steps towards self-protection. This approach transitions the focus from a hierarchical, technical response methodology to one that fosters collaborative support and collective action, leading to improved disaster literacy and preparedness while being sensitive to cultural dynamics.

Within this theoretical framework, the relevance of local knowledge is crucial for bolstering community resilience. It represents the amalgamation of value systems, insights, norms, and traditions passed down through generations. For example, the Tri Hita Karana doctrine in Bali emphasizes the importance of maintaining harmony among humans, nature, and the divine, serving as a guiding principle for ethical responses to disasters. Local leaders, such as *Jero Mangku*, act as spiritual mediators who interpret environmental cues and facilitate collective action, effectively bridging scientific understanding with indigenous beliefs. These cultural figures are trusted due to their deep-rooted social ties and representation of cultural symbols, making them integral to fostering shared learning and guiding disaster management efforts, viewed as a form of social evolution rather than merely a technical challenge.

In this paradigm, disaster literacy is understood as a collective endeavor that illustrates how communities perceive and utilize disaster-related knowledge in their everyday lives, influenced by cultural, spiritual, and social factors. This viewpoint emphasizes activities such as observing natural indicators, participating in rituals, and engaging in community discussions, all of which cultivate collective consciousness and social resilience. The study addresses a significant gap in the current literature by examining the influence of cultural and spiritual dimensions on disaster responses, particularly in communities such as Bali, where traditional value systems play a crucial role in preparation for disasters. By integrating scientific methodologies with local knowledge, this research aims to develop more inclusive and participatory approaches to disaster communication that honor and integrate traditional community values.

3. Methodology

3.1. Research Methodology

This study employs a qualitative research design, utilizing a case study strategy to investigate the dynamics of communicative learning rooted in local wisdom during the Mount Agung volcanic crisis. The research focuses on the villages of Amerta Bhuana and Duda Timur, situated in the Selat District of Karangasem Regency, Bali. The case study approach is particularly suitable for examining complex social, cultural, and spiritual dimensions that influence disaster communication, especially within communities characterized by rich traditions and evolving local practices. As emphasized by Gustafsson (2024), the strength of case study research lies in its capacity to analyze real-life phenomena within their specific temporal and geographical contexts, allowing researchers to uncover nuanced interrelationships that might otherwise remain obscured.

The explanatory orientation of this study aims to investigate how and why local communities in the Mount Agung area responded to disaster threats through culturally embedded communication mechanisms. The investigation focuses on the integration of indigenous knowledge into educational responses to crisis situations, including the transmission of messages, the development of disaster literacy, and the involvement of local actors such as *Jero Mangku* and *Pasebaya Agung*.

To interpret these phenomena, the research incorporates three theoretical frameworks: symbolic interactionism, which analyzes meaning-making through symbols and social interactions; communicator ethos theory, which considers the credibility and influence of local messengers; and disaster literacy, which emphasizes how communities acquire, process, and apply relevant knowledge in managing risks.

3.2. Research Subjects and Objects

Participants in this study consist of key informants directly involved in community-based disaster mitigation. This includes local leaders (*Perbekel*), religious figures within the Balinese Hindu tradition (*Jero Mangku*), volunteers affiliated with *Pasebaya Agung*, government officials such as those from the BPBD (Regional Disaster Management Agency), and residents with firsthand experience of the Mount Agung eruptions. Informants were selected through a snowball sampling technique, which enabled the researcher to identify individuals with rich experiential knowledge through referrals by initial contacts.

A total of 21 participants contributed to the research, distributed across the following categories:

- 4 religious leaders (*Jero Mangku*)
- 5 local government officials (village leaders and BPBD personnel)
- 6 residents with direct evacuation experience
- 3 community-based volunteers from *Pasebaya Agung*
- 3 educators and cultural observers familiar with disaster communication

Participant selection was guided by their involvement in disaster response and their roles in transmitting local wisdom through communicative and educational practices. The research pays particular attention to how cultural norms and spiritual values shape the development and dissemination of mitigation strategies.

The fieldwork was conducted in Amerta Bhuana and Duda Timur, two villages located within the high-risk zone of Mount Agung. These sites were purposively selected based on their historical exposure to the volcano's activity between 2017 and 2019 and their established traditions of culturally embedded disaster preparedness. Both communities demonstrated strong engagement in

ritual communication and collective educational efforts, making them ideal cases for this investigation.

3.3. Data Collection Methods and Techniques

This research utilized three primary data collection methods as outlined in Yin's case study protocol: in-depth interviews, naturalistic observations, and document analysis (Pauluzzo et al., 2018).

- *Semi-structured interviews* were conducted in person and via digital platforms such as Zoom and WhatsApp to adapt to mobility constraints during the pandemic. These interviews elicited participants' reflections on disaster experiences, spiritual interpretations of crisis events, and the role of communication in fostering communal resilience.
- *Observations* were carried out during community rituals, *banjar* meetings, and simulated evacuation exercises, enabling the researcher to document social behaviors and learning practices as they occurred in natural contexts.
- *Document analysis* included a review of 15 key sources: sacred texts (*lontar*), village archives, public announcements, and media reports, all of which contributed to triangulating the interview and observation data.

Table 1. Summary of Collected Data

Method	Description	Total Data Points
In-depth Interviews	Semi-structured conversations with community stakeholders	21 transcripts
Naturalistic Observation	Participation in rituals, village meetings, evacuation drills	22 field notes
Document Analysis	Review of local texts, media reports, and community archives	15 documents

This triangulated approach ensured a rich and multifaceted understanding of how culturally rooted communication shaped local responses to disaster.

3.4. Data Analysis Techniques

Data analysis in this study followed a descriptive qualitative framework centered on thematic analysis. The process began with data reduction—filtering relevant content aligned with the study's objectives—followed by the categorization of data into emergent themes and interpretive patterns. These themes were grounded in the cultural and communicative practices of the Balinese communities under study.

The analytical approach adhered to the six-phase model proposed by Braun and Clarke, supported by NVivo 14 software, which facilitated systematic coding and organization (Cernasev & Axon, 2023). Both inductive and deductive coding strategies were employed: inductive coding captured unanticipated insights from the field, while deductive coding was guided by the study's theoretical frameworks.

Key analytical units included the role of spiritual figures as communicators, the structure of local disaster messaging networks, and the symbolic significance of rituals in shaping understanding and action. Symbolic interactionism provided a lens to interpret how meaning is constructed and shared;

communicator ethos helped assess trust in message delivery; and disaster literacy allowed the analysis of how information was internalized and acted upon by the community.

To ensure analytical rigor, the study employed several validation strategies, including:

- *Source triangulation*: comparing data across participant groups
- *Method triangulation*: integrating interviews, observations, and document reviews
- *Theory triangulation*: analyzing data through complementary theoretical lenses
- *Member checking*: allowing participants to verify transcripts and interpretations
- *Peer debriefing*: engaging with academic peers to review emerging themes

3.5. Research Timeline and Location

The research was conducted over a five-year period from 2020 to 2025, encompassing both remote and on-site phases. Initial data collection (2020–2021) relied on virtual tools due to COVID-19-related restrictions, while subsequent phases (2022–2024) included in-depth fieldwork involving direct observations and interviews.

The research sites—Amerta Bhuana and Duda Timur—are located in the Selat District of Karangasem Regency, Bali. These villages were chosen through purposive sampling, given their direct exposure to Mount Agung’s volcanic hazards and their well-documented use of local knowledge in disaster preparedness. Both communities exemplify the integration of cultural traditions and spiritual authority in crisis communication.

The presence of community-based networks such as *Pasebaya Agung* and the influence of religious leaders (Jero Mangku) served as critical factors in the selection of these sites. Their active role in mobilizing knowledge, coordinating responses, and sustaining educational outreach during eruptions positioned them as exemplary models of culturally informed disaster communication, making them particularly relevant for the objectives of this study.

4. Result

The results presented in this chapter highlight that disaster literacy in Balinese communities emerges through the integration of symbolic, spatial, and social dimensions deeply embedded in ritual and everyday cultural practices. Symbols such as the *udeng* and *bebanten* function not only as ritual accessories but as pedagogical instruments that convey essential values related to emotional regulation, spiritual preparedness, and environmental harmony. The plain white *udeng* symbolizes clarity of mind and inner calm, while the black-and-white *udeng poleng* reflects the Balinese worldview of *Rwa Bhineda*, underscoring the importance of accepting dualities such as safety and risk, or order and chaos. Likewise, the structure of *bebanten* offerings—comprising natural elements like *pala bungkah* (earth), *pala gantung* (air), and *tirta* (spiritual water)—encapsulates lessons in ecological balance and ethical awareness. These symbolic forms of knowledge are transmitted intergenerationally, particularly during communal ceremonies like *piodalan*, where younger members actively engage in the preparation and interpretation of rituals. Through such practices, symbolic literacy becomes a lived and experiential process, reinforcing community values in ways that transcend formal education.

At the same time, spatial and social literacies are cultivated through ritual configurations and collective participation. Ritual spaces are arranged according to cosmological principles—such as the eastward orientation and the distinct placement of the *Jero Mangku*—which convey nonverbal teachings about sacred alignment, ethical leadership, and communal roles. These spatial cues promote an embodied understanding of one’s place within a broader spiritual and moral framework, resonating with the notion of critical consciousness proposed by Freire and expanded by Brown et al.

(2014). Additionally, community-based activities like *mebat* and *ngayah* serve as informal learning environments where mutual obligation and cultural transmission occur naturally. These practices build social cohesion and position disaster preparedness as a collective responsibility grounded in local identity. Taken together, the findings suggest that disaster education in Bali operates through a participatory and culturally grounded model, in which knowledge is co-constructed through symbolic expression, spatial ethics, and communal experience, fostering a form of resilience that is not only practical but also ethical and spiritually meaningful.

4.1. Communicative Learning: The Flow of Disaster Information

This section demonstrates that disaster learning in Balinese communities is rooted in culturally embedded practices that combine ecological awareness, spiritual communication, and community coordination. Natural signs such as volcanic tremors and animal behavior are interpreted collectively and conveyed through the *kentongan*, a traditional warning tool embedded with symbolic meaning. Spiritual leaders like *Jero Mangku* communicate risk through ritual actions, offerings, and sacred symbols, reinforcing ethical guidance grounded in local cosmology. Meanwhile, *Pasebaya Agung* bridges formal disaster information with cultural values using both technology and local language, fostering participatory education through community engagement. Together, these elements reveal a model of communicative learning that is contextually grounded, symbolically rich, and socially inclusive, shifting disaster education from passive reception to active, culturally meaningful knowledge co-creation.

4.1.1. Natural Signs and the Kentongan: The Community's Early Warning System

The community-based disaster response observed in the villages of Amerta Bhuana and Duda Timur illustrates a locally sustained early warning system that predates and complements official alerts. Rather than relying exclusively on government-issued announcements, residents interpreted various ecological cues—such as deep rumbling sounds (referred to locally as the “mountain’s cough”), increased volcanic glow at night, abnormal animal activity, and atmospheric changes—as credible precursors to volcanic hazards. As noted by Ni Nyoman Tri Artika:

“Before the eruption, we heard the ‘coughing’ sound from Mount Agung, a small tremor felt every week.” (Interview, 2024)

These signs form part of a deeply embedded ecological knowledge system, which enables communities to anticipate potential risks well before formal warnings are disseminated. The primary medium through which this local awareness is communicated is the *kentongan*—a traditional bamboo or wooden slit drum struck in deliberate rhythms at the village’s *banjar* to convey levels of danger. Within the local context, the sound of the *kentongan* transcends auditory signaling and functions as a culturally recognized symbol of communal alertness. As reported by I Wayan Suara Arsana:

“If someone hears an earthquake at night, the first person to wake up hits the *kentongan* as a warning. When the *kentongan* is struck loudly and repeatedly, it signals danger.” (Interview, 2024)

Grounded in symbolic interactionism, the *kentongan* serves not merely as a tool but as a semiotic artifact that fosters collective meaning-making. Its use triggers an automatic communal response rooted in shared understandings cultivated across generations. The educational dimension of this tool lies in its ability to promote swift behavioral adaptation without the need for verbal instruction, reflecting a form of disaster literacy that is both participatory and culturally situated.

Furthermore, the interpretation of these environmental signs is not limited to rational observation but is interwoven with spiritual sensibilities. Many residents report experiencing an

intuitive “feeling” or inner signal believed to originate from Mount Agung, indicating a form of awareness that is simultaneously ecological and metaphysical. This dual perception reveals a culturally hybrid model of learning—one that integrates physical observation with spiritual discernment.

Figure 1 illustrates the key locations within *Amerta Bhuana* and *Duda Timur* where *kentongan* instruments are strategically positioned as part of the early local warning infrastructure.

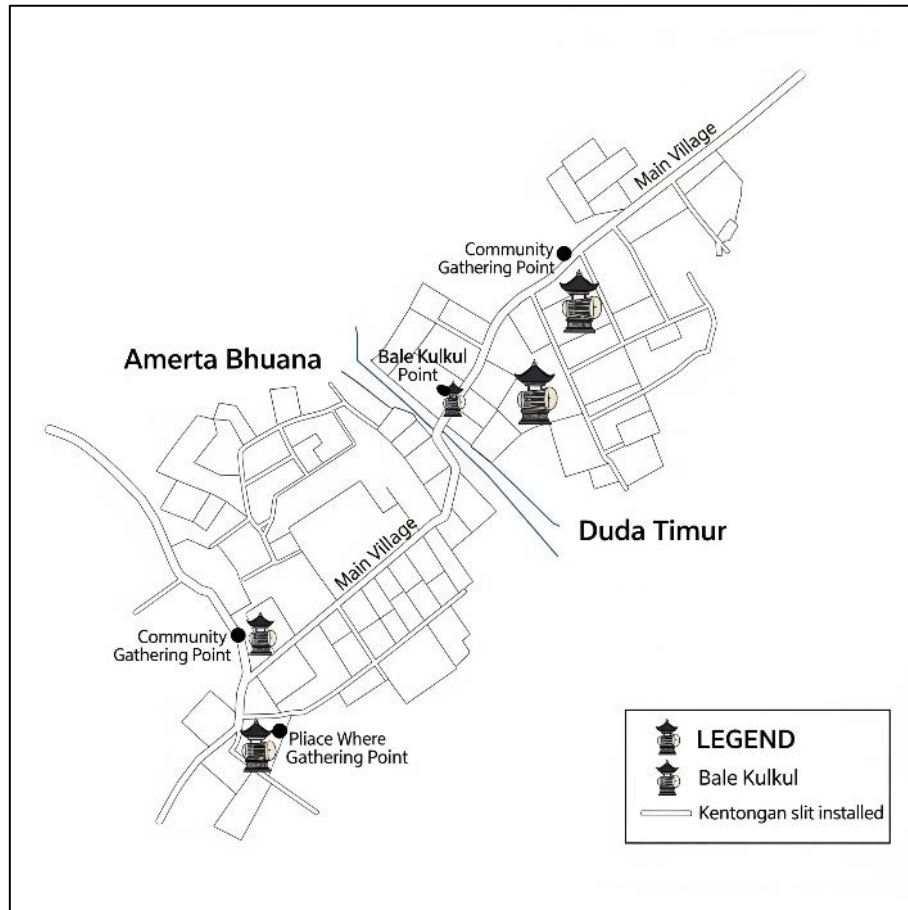


Figure 1. Spatial Distribution of the *Kentongan* Early Warning Network in Amerta Bhuana and Duda Timur

The following table outlines the observed natural signs, corresponding community actions, and the media through which such knowledge is communicated:

Table 2. Traditional Early Warning Indicators and Community Responses

Environmental Indicator	Community Response	Communication Medium
Volcanic rumbling (“mountain’s cough”)	Heightened alert, evacuation readiness	<i>Kentongan</i>
Unusual animal behavior	Securing children, alerting elders	Oral transmission, informal dialogue
Sky color transformation	Consulting local priests (<i>pemangku</i>)	Adat gatherings at the <i>banjar</i>
Light nighttime tremors	Assembling in temples or family compounds	<i>Kentongan</i> and symbolic messages (<i>pewisik</i>)

Each *kentongan* signal is interpreted according to established patterns: long, continuous strikes typically denote high alert, while brief, spaced strikes suggest non-emergency communication. This culturally coded signaling system exemplifies a form of disaster semiotics that is intuitive, efficient, and deeply rooted in collective memory.

The model presented here reflects what may be termed *environmental literacy in practice*, where community knowledge is shaped through direct interaction with nature, reinforced by tradition, and validated through spiritual consciousness. In this setting, education does not occur through formal instruction, but through immersion in cultural routines and environmental interpretation, developing into a locally responsive disaster learning process.

The integration of these practices into daily life, particularly in sacred or communal settings such as temples (*pura*) or community halls (*banjar*), highlights a participatory model of disaster education. It underscores the notion that learning in crisis is not only cognitive but also spiritual, symbolic, and socially enacted. Through tools like the *kentongan*, the community cultivates resilience, fosters collective action, and sustains cultural continuity amid environmental threats.

4.1.2. The Spiritual Authority of Jero Mangku: Communication through Ritual

In Balinese society, the figure of the *Jero Mangku*—a traditional temple priest and spiritual leader—plays an essential role in crisis communication during disasters. His authority extends beyond religious leadership; he acts as a cultural intermediary and a source of trusted guidance in times of uncertainty. Rather than relying on formal announcements or conventional public addresses, Jero Mangku communicates primarily through ritual performances, symbolic actions, sacred attire, spatial orientation, and the use of offerings. Each of these expressions serves as a meaningful message to the community, embedded within a shared spiritual and cultural context.

One of the most visible symbols used during times of heightened risk is the *udeng*—a traditional headband. When worn in plain white, it is widely recognized as a sign of spiritual emergency, signaling the community to prepare for potential evacuation. Similarly, the orientation of the priest during ceremonies—typically facing or aligning with Mount Agung—expresses symbolic loyalty to the sacred mountain, while the choice and composition of ritual offerings (*banten*) reflect a plea for cosmic protection and environmental balance. As explained by one priest:

“I will not evacuate until I receive a sign from *Sang Hyang Widhi*. I interpret it through dreams and voices that come in meditation.” (Interview, Jero Mangku D.A., 2024)

This reflection highlights a key aspect of spiritual communication in Balinese disaster response: decisions are not solely guided by external technical instructions, but are influenced by inner spiritual experiences and religious conviction. For many residents, messages conveyed through ritual carry more weight and credibility than those delivered via official channels or social media.

Table 3. Symbolic Elements in Ritual Communication by Jero Mangku

Symbol	Meaning in Communication	Educational Function
Plain white <i>udeng</i>	Indicates spiritual state of emergency	Signals the beginning of evacuation or heightened alert
Side-facing ritual posture	Reverence toward Mount Agung	Educates about spatial orientation and cosmological values
Ritual offerings (<i>banten</i>)	Appeal for divine protection	Teaches about balance with nature and spiritual ethics

Through these practices, Jero Mangku communicates messages that are not only informative but also pedagogical. Rooted in the philosophy of *Tri Hita Karana*—the harmonious relationship between humans, the environment, and the divine—his symbolic actions serve as a form of spiritual education that promotes preparedness, ethical behavior, and respect for natural forces.

Furthermore, the credibility of Jero Mangku is not based solely on his religious title. It is deeply connected to his moral integrity and spiritual discipline, as defined by the Balinese doctrine of *Sapta Timira*—the seven inner impurities: anger (*kroda*), greed (*loba*), confusion (*moha*), arrogance (*asuya*), envy (*matsarya*), lust (*kama*), and intoxication (*mada*). Only those who are perceived to have overcome these moral shortcomings are recognized as trustworthy spiritual guides. As affirmed by a local village head:

“Our trust in a Jero Mangku depends on the person, not just the title.” (Interview, 2018)

This statement reveals a form of community-based discernment, where symbolic legitimacy must be continually demonstrated through consistent ethical behavior and meaningful spiritual practice. In cases where individuals lack proper lineage, ritual experience, or fail to uphold community values, their authority may be questioned.

Ultimately, the communicative role of Jero Mangku during the Mount Agung crisis illustrates how spiritual symbolism can function as a powerful medium for public learning. His rituals offer more than religious observance; they become participatory acts of knowledge transmission, uniting the community through shared beliefs and cultural meaning. In this way, disaster education in Bali is not confined to institutional classrooms but takes place through sacred rituals, communal spaces, and interpersonal relationships that carry emotional, symbolic, and spiritual depth.

4.1.3. Pasebaya Agung: A Community-Based Hybrid Communication Hub

Pasebaya Agung—officially known as *Pasemetonan Jaga Baya Gunung Agung*—has emerged as a vital grassroots organization that supports disaster communication in Karangasem, Bali. Founded through the collaboration of 28 village leaders (*perbekel*), *Pasebaya* functions as a decentralized communication network that links institutional disaster information with local cultural frameworks. It bridges formal sources such as the BPBD and PVMBG with the lived experiences, languages, and belief systems of the affected communities.

Pasebaya’s approach is hybrid in nature, utilizing a mix of technological tools and culturally adapted communication practices. Tools such as handy talkies (HT), community radio, WhatsApp messaging groups, and mobile information units serve as the foundation for real-time updates and emergency coordination. However, what makes *Pasebaya*’s model distinctive is its integration of these technologies with local wisdom. Messages are crafted not only in accessible language but also often incorporate religious idioms, customary advice, and symbols that align with the values of Balinese society.

As noted by Syahbana et al. (2019), information shared by *Pasebaya* tends to be more trusted by local residents due to its proximity to the community and its deep connection with traditional institutions like the *banjar*. Observational data confirm that *Pasebaya* members regularly adjust their messaging based on local customs, employing the Balinese language and spiritual references that resonate more deeply than generic or bureaucratic communications.

“We chose HT because it reaches areas where cellular signal doesn’t. But we also rely on community meetings every evening at the *banjar* to deliver and discuss updates together.” (Interview with *Pasebaya* Radio Operator, 2024)

This dual-channel strategy ensures that even geographically isolated or technologically underserved villages remain informed and actively engaged. Community radio broadcasts and public gatherings at the *banjar* serve as both venues for information exchange and spaces for communal learning and decision-making. Through these platforms, residents not only receive updates but also participate in interpreting and responding to the evolving volcanic situation.

The communication infrastructure maintained by Pasebaya is visualized in Figure 2, which maps the interconnected nodes across 28 villages using HT networks and coordination posts. This decentralized structure enables timely, synchronized responses during emergencies and empowers each village to act as both a sender and receiver of verified information.

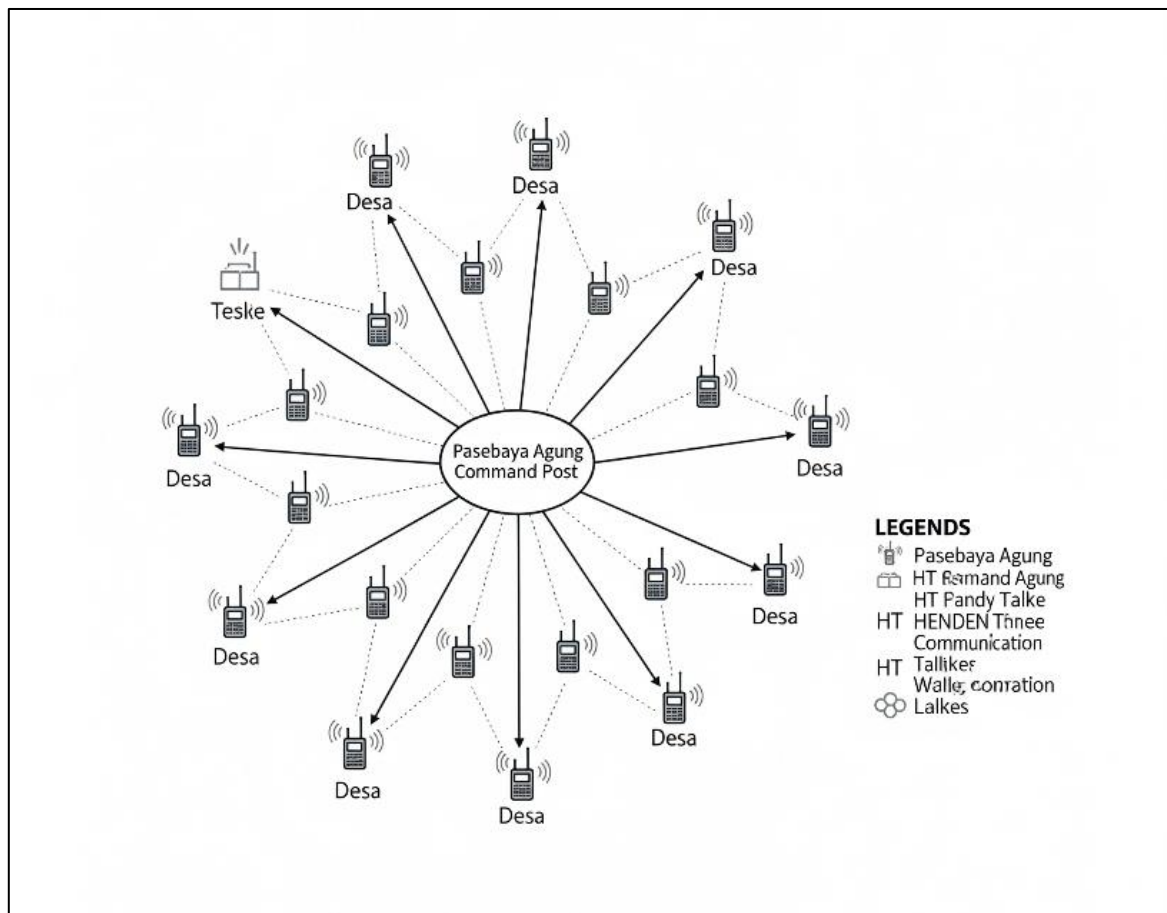


Figure 2. Communication Network of *Pasebaya Agung* (Source: Community documents and interview transcripts)

The following table outlines the primary communication channels used by *Pasebaya Agung* and their respective functions:

Table 4. Communication Tools and Outreach of *Pasebaya Agung*

Medium	Type of Information	Coverage
Handy Talkies (HT)	Real-time village-level situation updates	28 villages in Karangasem
Community Radio	Volcanic status and evacuation instructions	All areas within KRB II and III zones
Mobile Info Vehicles	Risk mitigation education, ritual reminders	Evacuation shelters and public areas

Beyond practical communication, Pasebaya plays an educational role in building disaster awareness and readiness. Its consistent presence and culturally relevant messaging contribute to what can be described as *participatory disaster education*. This model emphasizes shared understanding, emotional resonance, and co-produced knowledge rather than top-down dissemination.

Importantly, Pasebaya's collaboration with respected spiritual leaders such as *Jero Mangku* further strengthens the legitimacy of its communication. Messages that combine technical clarity with symbolic or religious references are more likely to be accepted and acted upon by community members, especially in contexts where sacred authority plays a critical role in shaping public decisions.

In this sense, Pasebaya exemplifies a holistic and culturally embedded framework for disaster communication. It effectively merges empirical knowledge with local wisdom, allowing community members to engage not merely as recipients of information but as active participants in managing risks. By fostering local agency, reinforcing community trust, and integrating technology with cultural understanding, Pasebaya contributes meaningfully to a more resilient and informed disaster response system.

4.2. Disaster Literacy: Cultivating Knowledge through Cultural Practice

This section demonstrates that disaster literacy within Balinese communities is cultivated through interconnected symbolic, spatial, and social practices deeply rooted in cultural and ritual traditions. Symbols such as the *udeng* and *bebanten* function not merely as ritual objects but as educational instruments that promote emotional regulation, spiritual preparedness, and ecological consciousness. The spatial orientation within ceremonial contexts—especially the directional alignment and distinct placement of figures like the *Jero Mangku*—facilitates spatial literacy, instilling a sense of moral responsibility, sacred directionality, and communal hierarchy. Concurrently, active participation in communal activities such as *mebat* (collective cooking) and *ngayah* (voluntary service) nurtures social literacy by fostering intergenerational learning, mutual accountability, and the reinforcement of cultural identity. These integrated practices reflect a participatory and experiential model of disaster education, where knowledge is not disseminated through formal pedagogy but embodied in daily actions, symbolic expressions, and spiritual routines—thus fostering a form of resilience that is ethically grounded, culturally resonant, and socially embedded.

4.2.1. Symbolic Literacy: The Educational Meaning of Udeng and Bebanten

In Balinese culture, symbols play a crucial educational role in shaping collective disaster awareness. Rather than functioning merely as traditional artifacts, these symbols operate as dynamic tools that facilitate intergenerational learning, emotional regulation, and ethical reflection, especially during periods of crisis. Through their integration in ritual practices, symbols such as the *udeng* and *bebanten* serve as embodied texts that convey values central to resilience and spiritual alignment.

The *udeng*, a traditional Balinese headcloth worn primarily by men during religious observances, carries layered philosophical meanings. The plain white *udeng* signifies inner purity and mental clarity, often interpreted as a form of spiritual readiness in the face of uncertainty. Conversely, the checkered black-and-white *udeng poleng* reflects the Balinese principle of *Rwa Bhineda*, which symbolizes the coexistence of opposites—safety and danger, light and darkness, order and chaos. Through its visual duality, the *udeng* teaches that disasters are not aberrations, but intrinsic parts of cosmic balance that should be understood with equanimity and dignity.

In disaster contexts, wearing the *udeng* becomes more than ritual compliance—it becomes an intentional pedagogical gesture. It signals preparedness not only in a physical sense but in spiritual

and emotional terms. A local religious figure emphasized this perspective by noting that ritual readiness often begins with subtle signs and meditative insight:

“I will not evacuate until I receive a sign from Sang Hyang Widhi. I read it through dreams, through voices during meditation.” (Interview, Jero Mangku D.A., 2024)

Complementing the symbolic literacy of *udeng* is the practice of *bebanten*, or ritual offerings, which act as living texts filled with cosmological and environmental messages. Each offering is composed of carefully selected elements—*pala bungkah* (earth), *pala gantung* (air), and *tirta* (water/spirituality)—that represent essential aspects of life and nature. These components are not merely decorative; they are didactic in nature. The act of arranging the offerings teaches harmony, proportionality, and respect for the environment. As one community leader explained:

“We learn from the offerings that everything in this world must be given its rightful place; nothing should be neglected. If one element is forgotten, nature will deliver a warning.” (Interview, I Wayan Suara Arsana, 2024)

These symbolic practices function not just within sacred rituals but also as culturally embedded educational methods. During major ceremonial events like *piodalan*—village temple festivals—children and youth are actively involved in preparing offerings, weaving palm leaves, and learning prayers. This hands-on participation encourages embodied learning and cultivates an understanding of ethical and spiritual responsibility. Through such practices, disaster education becomes part of daily life, encoded within ritual and cultural transmission.

Accordingly, both *udeng* and *bebanten* contribute to the development of symbolic literacy, which integrates spiritual, moral, and cognitive dimensions of disaster preparedness. These forms of knowledge are not disseminated through formal instruction but are experienced, practiced, and internalized through direct engagement. They promote emotional resilience, self-awareness, and ecological sensitivity in ways that resonate deeply with the community’s lived experience.

Table 5. Cultural Symbols and Their Educational Functions in Balinese Disaster Literacy

No	Symbol or Practice	Meaning Related to Disaster Literacy	Educational Function
1	<i>Udeng</i> (white)	Mental clarity and inner purity	Encourages emotional control and spiritual readiness
2	<i>Udeng poleng</i> (black-white)	Duality of life (<i>Rwa Bhineda</i>)	Promotes philosophical reflection on balance and acceptance
3	<i>Bebanten</i> (offerings)	Harmony between nature and the sacred	Imparts ecological awareness and communal responsibility
4	Ritual participation	Socialization of values and intergenerational bonding	Fosters cultural continuity and experiential learning



Figure 3. White and Poleng Udeng as Visual Symbols of Preparedness and Cosmic Awareness



Figure 4. The Structure of Bebanten as a Framework for Ecological and Spiritual Knowledge

In summary, symbolic literacy in Balinese disaster education demonstrates how traditional cultural expressions serve as powerful learning mechanisms. Far from being abstract or outdated, these practices create a relevant, participatory model of disaster literacy—one that emphasizes harmony with nature, reverence for sacred values, and a deeply rooted sense of communal responsibility. This approach affirms the importance of integrating indigenous knowledge into contemporary educational discourse, especially in the context of disaster preparedness and resilience-building.

4.2.2. Spatial and Social Literacy: Learning through Ritual Positioning and Participation

In the Balinese context, spatial and social arrangements within ritual settings serve as meaningful platforms for cultivating disaster-related knowledge. These configurations are not merely

ceremonial; rather, they function as culturally embedded systems of learning that foster collective awareness and ethical positioning in response to natural hazards.

One clear example of *spatial literacy* is found in how participants are arranged during religious ceremonies. Rituals typically follow cosmological orientations, particularly facing east (*kangin*), which is associated with sacred energy and divine presence. The Jero Mangku, a central religious figure, is positioned apart from other participants in a manner that visually reinforces spiritual hierarchy. This physical separation is more than symbolic; it conveys moral instruction, exemplifies leadership, and underscores the responsibilities inherent in each societal role.

As shown in Figure 5, the deliberate placement of the Jero Mangku within ritual space illustrates how spatial arrangements communicate authority, reverence, and social order without verbal explanation:

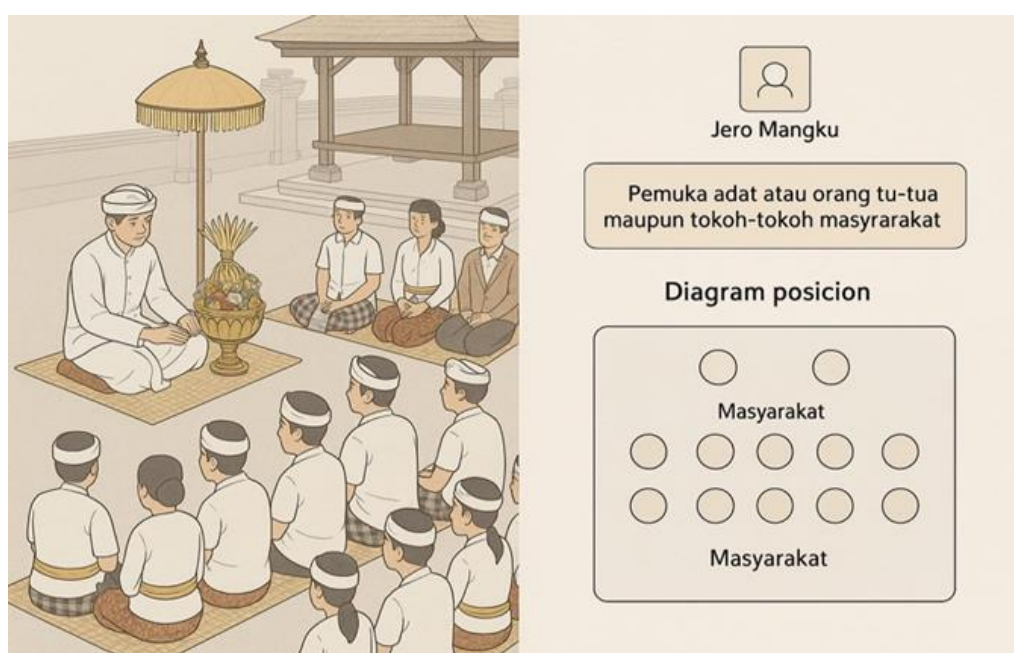


Figure 5. The seating position of Jero Mangku in customary councils is a form of spatial ethics and ritualized authority.

This structuring nurtures an awareness of sacred space and fosters *spatial literacy*—the ability to perceive and act according to spatial, ethical, and cosmological frameworks. This aligns with the concept of *conscientização*, or critical consciousness, as proposed by Freire and further explored by Brown et al. (2014), emphasizing that meaningful learning arises through one’s interaction with their social and physical environment before formal knowledge is processed.

Equally important is the communal nature of ritual participation. Activities such as *mebat* (pre-ceremonial communal cooking), *ngayah* (voluntary religious service), and informal deliberations in the *banjar* (village hall) provide social spaces for experiential learning. These practices promote a sense of mutual obligation and reinforce community-based knowledge systems. Here, individuals do not merely observe religious rituals—they engage with them directly, reinforcing disaster preparedness as a shared responsibility grounded in cultural identity.

This participatory model cultivates *social literacy*—the capacity to understand one’s role within collective systems, engage in coordinated action, and foster solidarity during crises. By actively participating in rituals, community members internalize core values, such as mutual care, ecological respect, and collective vigilance—essential components for building resilience.

To illustrate the educational contributions of these practices, Table 6 presents key symbols and rituals that represent elements of Balinese disaster literacy:

Table 6. Symbols and Practices Representing Disaster Literacy in Balinese Society

No	Symbol / Practice	Interpretation of Disaster Literacy	Educational Function
1	Udeng (traditional headband)	Mental clarity, spiritual sanctity, balance of opposites	Reinforces emotional regulation and spiritual awareness
2	Bebanten (ritual offerings)	Gratitude, environmental harmony, spiritual communication	Encourages ethical reflection and collective ecological responsibility
3	Seating arrangement	Hierarchical ethics, sacred spatial alignment	Cultivates respect for structure, authority, and communal roles
4	Ritual participation	Cultural transmission, symbolic immersion, social engagement	Fosters transgenerational learning and strengthens social cohesion

In conclusion, spatial and social literacy in Balinese communities offers a culturally nuanced form of disaster education that extends far beyond formal instruction. It represents a participatory, experiential, and symbolically rich framework for preparing communities to face ecological threats with emotional, ethical, and spiritual readiness.

This model of literacy demonstrates how local knowledge systems—rooted in ritual and everyday practice—can play a transformative role in enhancing resilience. By emphasizing interconnectedness, shared roles, and sacred space, Balinese disaster literacy contributes to a broader understanding of how education can be both context-specific and universally relevant in the face of global environmental challenges.

5. Discussions

This study demonstrates that learning in times of crisis surpasses conventional pedagogical frameworks or rigid technical guidance. Instead, it is shaped by communication practices deeply anchored in cultural values and closely tied to the lived experiences of the community. In Balinese society, disasters are not seen solely as geophysical events that require technical intervention. They are perceived as spiritual and socio-cultural disruptions that call for collective meaning-making, a reassessment of values, and unified moral responses. These findings are consistent with earlier research (Hastuti & Sadeli, 2024; Putri et al., 2024) that highlights the importance of local knowledge systems and traditional social structures in creating disaster mitigation strategies that are both sustainable and socially endorsed.

One of the key theoretical contributions of this study is its confirmation of the central role of communicative figures—especially spiritual leaders like *Jero Mangku*—in advancing disaster education. The ethos represented by *Jero Mangku*, rooted in ritual authority, moral integrity, and cultural legitimacy, functions not only as a source of warnings but also as a guide for ethical reflection and emotional support within the community. Symbolic elements such as *pewisik* (spiritual messages), *bebanten* (ritual offerings), and *kentongan* (traditional alarm instruments) act as educational tools that convey culturally meaningful messages, fostering disaster awareness in ways that are both participatory and emotionally resonant. These observations enrich Communicator's

Ethos Theory (Hasmawati, 2020) and reaffirm the relevance of Symbolic Interactionism (Efendi et al., 2024) in non-Western communal contexts. In particular, this study offers a new perspective in the field of communication studies, showing that communication effectiveness is influenced not only by the message content but also by the communicator's embeddedness in cultural belief systems, ritual symbolism, and spiritual legitimacy.

The study also provides valuable insights into disaster education, portraying disaster literacy as culturally mediated and participatory knowledge. Rather than being limited to technical skills, disaster literacy in this context emerges through intergenerational transmission, lived experiences, and meaningful engagement in communal rituals. Activities such as wearing the *udeng* (traditional head covering), observing ritual spatial arrangements, and participating in ceremonies represent informal educational practices that cultivate ethical awareness, ecological harmony, and spiritual discipline. These findings enrich the concept of cultural literacy (Brown et al., 2014; Karabey & Aygün, 2022) and align with Freire's (1970) notion of *conscientização* (critical awareness), where learning is inseparable from social context, dialogue, and collective action. The study thus proposes a fresh theoretical perspective on participatory learning models that emerge through the integration of symbolic communication, ritual practices, and community dialogue.

Additionally, this research contributes to the sociology of education by highlighting how disaster education occurs not just in formal settings, but also within sacred and social spaces through daily practices and moral performances. Forms of participation such as *mebat* (communal cooking), *ngayah* (volunteering for spiritual purposes), and *banjar* (village meetings) provide informal curricula that reinforce identity, solidarity, and preparedness for disasters. The study encourages a view of education as a social process where values, symbols, and collective responsibilities intersect to build community resilience.

The collaboration between formal institutions (such as BPBD and PVMBG) and community-based organizations (such as *Pasebaya Agung*) illustrates the strength of hybrid communication systems that integrate scientific reliability with cultural relevance. This supports the concept of communication ecology (Voets et al., 2021) and underscores the importance of distributed, culturally sensitive communication networks in enhancing disaster response capacity. However, the study also identifies ongoing challenges, including limited technology, weak coordination among actors, and tensions between scientific approaches and traditional cosmologies. Addressing these issues requires stronger collaborative governance (Nasrulhaq, 2020) through more inclusive and dialogic platforms.

Ultimately, this research advances the theoretical framing of disaster education by positioning it as an ethical, symbolic, and culturally rooted communal learning process. The case of Mount Agung offers a meaningful model of participatory learning that integrates ecological awareness, spiritual values, and cultural transmission, contributing to a more holistic and inclusive approach to resilience education in multicultural settings.

6. Conclusions

This study provides meaningful insights into how local cultural and spiritual beliefs shape disaster communication and education within Balinese society. The findings reveal that disasters are not regarded solely as physical events but as disruptions to the cosmic order that demand moral reflection and collective ritual responses. This perspective aligns with *Tri Hita Karana*, the Balinese philosophy that stresses harmony between humanity, nature, and the divine.

A significant contribution of this research lies in demonstrating that disaster education in Bali is practiced through participatory cultural literacy, as evident in traditions such as wearing the *udeng*, creating *bebanten* (ritual offerings), observing spatial orientation during ceremonies, and engaging in sacred communal activities. These practices are far more than religious formalities; they function as

dynamic educational processes that foster disaster awareness, strengthen social cohesion, and build emotional and spiritual resilience across generations.

The study also highlights the practical value of hybrid communication models that connect formal institutional structures with culturally embedded systems. By demonstrating effective collaboration between official agencies (BPBD, PVMBG) and community-based groups (*Pasebaya Agung*), it offers a model for adaptive communication strategies that respect both scientific authority and cultural legitimacy.

Nevertheless, challenges persist, particularly regarding technological limitations, fragmented institutional coordination, and the need for more meaningful dialogue between technical and traditional actors. These challenges point to the necessity of enhancing local capacity and developing inclusive governance frameworks to improve future disaster management.

In summary, this study enriches the discourse on disaster education by promoting the integration of local knowledge systems and cultural perspectives into formal preparedness initiatives. The findings advocate for a reorientation of disaster education methods beyond technical training alone, emphasizing the importance of culture-based, spiritual, and community-driven learning as key elements in building resilience during crises. Although rooted in the Balinese context, the theoretical and practical implications of this research are relevant to other culturally rich regions facing complex disaster challenges.

7. Limitations

While this study provides meaningful insights into disaster communication and educational practices shaped by Balinese local wisdom, it is important to acknowledge several limitations that may influence how the findings are interpreted and applied.

To begin with, the study was conducted in two specific communities—Amerta Bhuana and Duda Timur—that are characterized by distinct cultural, spiritual, and social features. As a result, the conclusions drawn from this research may not be easily generalizable to communities outside Bali or to regions with different cultural values and social systems. Although the theoretical framework developed in this study offers potential for broader application, its use in other contexts would require careful adaptation to local cultural settings.

Another limitation relates to the research methods. Due to restrictions during the COVID-19 pandemic, some interviews had to be conducted online rather than in person. This may have limited the opportunity to fully observe non-verbal cues and symbolic expressions, which are vital components of culture-based communication. Although the study applied data triangulation by combining interviews, observations, and document analysis, these conditions may have limited the richness of the data collected.

Furthermore, although the study integrates perspectives from *symbolic interactionism*, *communicator ethos*, and *disaster literacy* theories, it does not explore in detail how issues such as power dynamics, gender relations, and social status may influence disaster communication and knowledge-sharing within the community. These dimensions could play an important role in shaping how information is received and acted upon in disaster contexts.

Lastly, the study faced technical challenges in accessing complete secondary data, including historical records and administrative documents from the time of the Mount Agung eruption. Much of the historical understanding was based on collective memory and oral storytelling, which, while valuable, may contain certain biases linked to how memories are reconstructed over time.

In light of these limitations, future research would benefit from including a wider range of communities, adopting more interdisciplinary approaches, and strengthening the use of long-term

documentation. These efforts would help provide a fuller picture of how local wisdom shapes disaster communication and learning in different settings.

8. Suggestions

In light of the results derived from this investigation, it is apparent that the incorporation of local knowledge into disaster education in Bali presents an innovative and culturally pertinent strategy for crisis management. Drawing insights from the educational communication methods observed during the Mount Agung eruption, several significant recommendations can be put forth for future inquiries and practical implementations in the domain of disaster education.

To begin with, it is crucial to understand that disaster education extends beyond merely conveying technical information. It must also encompass cultural, spiritual, and symbolic dimensions. The Balinese methodology, which seamlessly merges scientific comprehension with traditional insights, illustrates the efficacy of a hybrid communication model that could be implemented in other disaster-prone areas, especially those rich in cultural heritage. Educators and professionals involved in disaster management ought to pursue strategies that integrate scientific risk communication with locally recognized practices, symbols, and values to improve community involvement and trust.

Furthermore, the involvement of local leaders, such as Jero Mangku, underscores the necessity of embedding esteemed cultural figures within disaster communication frameworks. These leaders not only act as vessels of spiritual guidance but also engage with the community, possessing deep-rooted connections. Subsequent research should investigate how various communities worldwide incorporate their cultural authority figures into crisis communication approaches, assessing the effects of such integration on the efficacy of disaster preparedness and response.

Another important recommendation is the enhancement of community-oriented disaster communication frameworks, as illustrated by the *Pasebaya Agung* initiative. This decentralized and grassroots communication strategy effectively disseminated real-time information and facilitated evacuations during the eruption. By bolstering local communication networks, such as community radio and peer-to-peer systems, the community's ability to react to crises can be substantially elevated. Future studies could examine ways to optimize these networks, concentrating on the advancement of communication infrastructure and the training of community members in effective disaster communication management.

Moreover, there is an urgent need for collaborative governance structures that bridge the divide between formal disaster management institutions and local communities. Although formal agencies provide scientific credibility, their communication initiatives may not consistently align with local beliefs and practices. Thus, developing platforms that promote knowledge exchange between the realms of science and culture can cultivate a more inclusive and adaptive disaster response. This requires sustained dialogue among governmental entities, traditional leaders, and community members to foster trust and mutual comprehension.

Lastly, educational programs need to be formulated to foster disaster literacy as a continuous, intergenerational endeavor. As exemplified in Bali, disaster literacy should not be viewed as a static compendium of information but rather as a dynamic, lived experience transmitted across generations. Educational efforts must prioritize experiential learning, engaging communities in disaster preparedness through rituals, community assemblies, and cultural traditions. This methodology can be adapted in other regions characterized by rich cultural practices, thereby promoting resilience through the imparting of knowledge that encompasses not only technical aspects but also symbolic, spiritual, and communal elements.

In summary, integrating local wisdom, cultural practices, and community-led communication frameworks creates a strong foundation for disaster education. Moving forward, it is essential to

continuously refine disaster communication strategies that are contextually relevant, culturally attuned, and participatory. This ensures that communities are not only adequately equipped for crises but are also empowered to respond in ways that resonate with their values and traditions.

Declarations

Author Contributions. All authors contributed to the study's planning, design of the data collection instrument, and data collection and analysis. The first author led the writing process with assistance from other authors. All the authors read and approved the final manuscript.

Conflicts of Interest. The authors declare no conflict of interest.

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Ethical Approval. (Please provide information on respect for privacy and approval by the ethics committee/ethical approval with the reference number.)

Data Availability Statement. The data supporting this study's findings are available on request from the corresponding author. The data is not publicly available due to privacy or ethical restrictions.

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