Research Article

The Bekasi City Fire Department's Disaster Communication Socialization at SMK Vinama 2 Bekasi

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Abstract: This study explores the communication patterns used by the Fire and Rescue Department of Bekasi City in disseminating fire disaster mitigation education at SMK Vinama 2 Bekasi. The research investigates how disaster communication is implemented through socialization programs aimed at increasing students' awareness and preparedness toward fire hazards. Using a qualitative descriptive approach, data were collected through interviews, observation, and documentation with key informants, including officials from the Prevention Division, school representatives, and student participants. The findings reveal that the department adopts a multi-layered communication model integrating one-way, two-way, and multi-way approaches to effectively convey safety messages. The process involves formal coordination, practical demonstrations, and participatory simulations, contributing to improved literacy and proactive attitudes among students. This study highlights the essential role of structured communication patterns in enhancing disaster preparedness and proposes recommendations for strengthening participatory engagement in future educational programs.

Keywords: Disaster Communication; Fire Mitigation; Public Education; Communication Pattern; Bekasi Fire Department

1. Introduction

Fire disasters remain one of the most prevalent and destructive non-natural hazards in densely populated urban areas, particularly in Indonesia. Beyond physical damage, fire incidents pose significant threats to public safety, community stability, and environmental sustainability. The Fire and Rescue Department plays a pivotal role in not only responding to emergencies but also preventing them through community education and disaster communication initiatives. As stated by Ma'romah (2020), firefighters are trained not only to extinguish fires but also to perform rescue operations, respond to various emergencies such as building collapses and traffic accidents, and educate the public about safety practices.

The Bekasi City Fire and Rescue Department, as a government institution responsible for fire prevention and emergency response, has developed systematic outreach programs designed to promote public awareness. According to Yazid (2022), fire departments function as both operational emergency units and community educators tasked with building resilience and preparedness. In Bekasi City, the Prevention Division leads educational activities that target schools, communities, and industrial sectors to instill knowledge about fire risks and mitigation techniques.

Statistical data on disaster literacy in West Java indicate a concerning level of public awareness, with only 45% literacy in disaster preparedness, encompassing competencies such as information identification, evaluation, organization, and utilization (Marlyono et al., 2016). This relatively low percentage reflects a gap between information dissemination and effective public comprehension. Consequently, the Bekasi Fire Department has intensified its

socialization efforts, particularly among students, who represent a vulnerable yet influential demographic in the propagation of disaster awareness.

Fire disaster education at the school level plays a crucial role in nurturing early preparedness. As Sa'ban et al. (2023) note, disaster education represents an interactive socialization process that builds awareness, develops understanding, and fosters behavioral adaptation toward safety practices. Students, especially those in vocational schools, are more susceptible to fire hazards due to practical laboratory work, electrical usage, and the handling of flammable materials. Therefore, integrating disaster education into school activities aligns with Indonesia's national disaster management policy under Law No. 24 of 2007, which emphasizes preventive action through community education and awareness programs.

In response to this context, the Bekasi Fire Department's Prevention Division designed a comprehensive socialization program that includes both theoretical instruction and practical simulation. The process begins with formal correspondence between schools and the department, followed by coordination on schedules, materials, and technical logistics such as safety equipment (e.g., fire extinguishers, hoses, and gas cylinders). The implementation involves interactive communication between instructors and students through demonstrations, video materials, printed leaflets, and evacuation drills.

The present study focuses on examining the communication patterns employed by the Bekasi Fire and Rescue Department during its fire mitigation education program at SMK Vinama 2 Bekasi. The choice of this school is based on its proactive involvement in occupational safety initiatives and its openness to integrating disaster prevention education within the curriculum. Furthermore, the program serves as a practical application of disaster communication theories in real-world educational settings.

Disaster communication, according to Lestari (2018), serves not merely as information delivery but also as a social mechanism that shapes public values, norms, and responses toward emergencies. Effective communication ensures that knowledge transfer occurs interactively, leading to behavioral changes rather than passive awareness. Similarly, Tahmidatem and Krismanto (2019) emphasize that pre-disaster communication encompasses preparedness, warnings, and mitigation strategies that reduce potential losses.

The research thus aims to understand how communication functions as a mediating process in fire disaster education. Specifically, it investigates: a). How the Bekasi Fire Department organizes and executes its fire disaster socialization activities; b). What communication patterns (one-way, two-way, or multi-way) are adopted during the program; and; c). How these communication patterns influence students' disaster literacy and preparedness.

By exploring these dimensions, the study contributes to the broader field of disaster risk communication and educational communication, offering insights into how government institutions can leverage communication models to foster public resilience. It also aligns with the United Nations' Sendai Framework for Disaster Risk Reduction (2015–2030), which underscores the importance of education and communication in building disaster-resilient communities.

The significance of this research lies in its interdisciplinary relevance. From a communication perspective, it highlights the adaptation of classical communication theories—such as Shannon and Weaver's (1949) one-way model, Schramm's (1972) two-way feedback model, and McLuhan's (1964) multi-directional communication model—within the context of fire disaster mitigation. From a public administration and education perspective, it provides an empirical understanding of how institutional communication strategies can effectively translate into behavioral preparedness among students.

Ultimately, this study underscores that effective disaster communication is not merely about transmitting warnings or technical information but about cultivating a participatory culture of safety and awareness. Through structured and interactive educational communication, the Bekasi Fire Department seeks to transform passive audiences into active agents of prevention. The following sections detail the related theoretical foundations, methodological approach, empirical findings, and implications derived from this field investigation.

2. Preliminaries or Related Work or Literature Review

Communication Patterns in Disaster Contexts

Communication patterns describe the structured flow of messages between senders and receivers, shaping how understanding and behavioral responses are formed. Littlejohn and Foss (2009) define communication patterns as relational processes that connect participants through shared meaning and message exchange. Within disaster contexts, communication patterns become critical in influencing how individuals perceive risks, prepare responses, and coordinate actions.

One-way communication, introduced by Shannon and Weaver (1949), views communication as a linear transmission model consisting of five key elements: source, transmitter, channel, receiver, and destination. In this model, feedback is absent, and noise can distort message delivery. While effective for broadcasting warnings or announcements—such as public alerts via radio or television—one-way communication often limits interactivity and fails to capture the audience's responses or comprehension.

In contrast, two-way communication, developed by Schramm (1972), emphasizes reciprocity and feedback between sender and receiver. It allows message verification, encourages participation, and ensures comprehension through interaction. In disaster education, this model facilitates interactive learning sessions where instructors and participants exchange ideas, questions, and feedback—enhancing the retention of safety practices.

McLuhan (1964) advanced the notion of multi-directional or networked communication, arguing that electronic and digital media transform audiences from passive receivers into active participants. In this "global village," information flows dynamically through multiple nodes, enabling real-time collaboration and feedback. This model aligns closely with contemporary disaster communication practices where communities, institutions, and media platforms co-create and disseminate information in participatory ways.

In the context of fire disaster education, combining these communication models is essential. While one-way communication serves to disseminate general knowledge through printed and digital materials, two-way and multi-way approaches foster engagement through simulation, discussion, and collaboration. The integration of these models contributes to a holistic framework of risk communication, wherein messages are not only delivered but also internalized and acted upon by target audiences (Terpstra et al., 2017).

Disaster Education and Literacy

Disaster education represents a systematic effort to instill awareness, preparedness, and risk reduction skills through structured learning. Winarni and Purwandari (2018) emphasize that disaster education must cultivate preventive and curative attitudes embedded as cultural values from an early age. Educational institutions play a strategic role in nurturing disaster literacy, ensuring that students understand potential hazards, appropriate responses, and post-disaster recovery mechanisms.

Nifa et al. (2017) categorize the objectives of school-based disaster education into three main domains: (1) increasing knowledge and awareness of disaster risks, (2) developing adaptive behaviors and self-protection skills, and (3) building resilience through community participation. Likewise, Ronan et al. (2015) and Chung and Yen (2016) argue that disaster education enhances not only cognitive understanding but also emotional and behavioral readiness, forming what they term disaster literacy—a combination of knowledge, attitudes, and practical skills.

Kagawa and Selby (2014) outline five core dimensions of disaster education: understanding scientific mechanisms of hazards, learning and practicing safety procedures, recognizing risk factors, strengthening community capacity, and fostering a safety culture. Schools thus become the epicenters of disaster literacy dissemination, serving as hubs for knowledge exchange among students, teachers, and parents (Shiwaku & Sakurai, 2016).

Dufty (2020) proposes the Engagement–Communication–Education (ECE) framework, which harmonizes three interconnected elements—community engagement, effective communication, and education—to enhance public preparedness. Within this framework, disaster education can occur across four modes (Schneider, 2013):

Informal education, occurring spontaneously in daily life or through social media learning;
Incidental education, derived from unstructured exposure such as news broadcasts or emergency alerts;
Formal education, structured within school curricula; and
Non-formal education, conducted through extracurricular or community-based programs.

In Indonesia, the formalization of disaster education is legally mandated through Law No. 24 of 2007 on Disaster Management, which positions schools as formal institutions for disaster risk training (Direktorat Jenderal Pendidikan Dasar dan Menengah, 2018). Accordingly, fire disaster education at SMK Vinama 2 Bekasi embodies this mandate by integrating practical safety training into its curriculum, supported by government partnerships.

Disaster Communication Typologies

Disaster communication involves a set of structured processes to ensure accurate, timely, and actionable information dissemination before, during, and after a disaster event. According to Ismail and Resa (2024), the primary objectives of disaster communication include raising awareness, promoting preparedness, coordinating multi-agency responses, and providing clear recovery information.

Natural Disasters. In the case of floods, earthquakes, or volcanic eruptions, communication aims to provide early warnings and evacuation guidance. Fire departments and emergency services often utilize one-way and two-way channels—such as sirens, text alerts, and community briefings—to inform the public and coordinate rescue operations (Nurussa'adah, 2021).

Non-natural Disasters. These include technological or industrial incidents, where risk communication focuses on preventive awareness and safety compliance. The Fire Department's outreach to industries and schools exemplifies this proactive communication form, addressing hazards like electrical malfunctions, gas leaks, or laboratory fires.

Social Disasters. During social conflicts or crowd incidents, effective communication helps maintain order, prevent panic, and guide collective action. Information accuracy and trust in official sources are paramount to avoid misinformation and escalation.

Technological Failures. Fire departments also manage communication during industrial fires or hazardous material leaks. These scenarios demand technical precision and collaboration between safety officers and emergency responders to mitigate cascading effects (Ismail & Resa, 2024).

The Bekasi Fire Department integrates these typologies into its public outreach. Its Prevention Division employs multi-channel communication—combining in-person briefings, visual media, and simulation exercises—to reinforce preparedness at both institutional and community levels. Such integration exemplifies a hybrid communication ecosystem, blending traditional media with participatory approaches.

Previous Studies on Fire Disaster Communication

Prior research provides significant insights into the development of disaster communication strategies. Rasmani et al. (2021) examined self-readiness education for early childhood and found that continuous socialization enhances children's sensitivity to environmental risks. Firman et al. (2023) highlighted early-age fire mitigation programs in Baubau City, demonstrating the importance of regular awareness campaigns conducted by fire departments. Similarly, Andini et al. (2020) identified communication and coordination challenges in Samarinda's fire prevention efforts, noting that weak public engagement often hampers the effectiveness of preventive measures. Irawan et al. (2024) evaluated fire disaster mitigation education through pre-test and post-test assessments, revealing that student understanding improved dramatically—from 63% to 92% comprehension after participation.

These studies collectively underscore that effective communication, participatory education, and continuous socialization are fundamental in cultivating disaster literacy. However, most prior research focuses either on technical education or community engagement, leaving a limited exploration of the communication pattern itself as a structured process within institutional disaster mitigation programs. The present study addresses this gap by analyzing how the Bekasi Fire Department's communication approach—particularly its combination of one-way, two-way, and multi-directional models—facilitates learning outcomes and behavior change among students.

3. Proposed Method

Research Design

This study employed a qualitative descriptive research design aimed at exploring and interpreting the communication patterns implemented by the Fire and Rescue Department of Bekasi City in conducting its fire disaster mitigation socialization at SMK Vinama 2 Bekasi. Qualitative methods are suitable for uncovering meanings, experiences, and social processes from participants' perspectives within their natural contexts (Strauss & Corbin, 2003). The focus of qualitative inquiry in this research lies in understanding the *how* and *why* of disaster communication practices—specifically, how the fire department communicates preventive measures and how students perceive and respond to those messages.

A descriptive design was selected to enable the researcher to portray the real conditions of the communication process, the roles of actors involved, and the interactional dynamics during the implementation of the disaster education program. This design allows for rich, detailed descriptions of the observed phenomena rather than statistical generalization (Rusandi, 2014).

The research also adopted an interpretive paradigm, emphasizing that social reality is constructed through communication and shared meaning. In this context, the researcher acts as an instrument of inquiry, interpreting data gathered through observation, interviews, and documentation to uncover the underlying communication strategies and patterns used by the Prevention Division of the Fire Department.

Research Setting and Participants

The research was conducted in Bekasi City, West Java, Indonesia, specifically at two sites:

The Fire and Rescue Department of Bekasi City, located at Jl. Harapan Indah Raya No. 9, Medan Satria District, which serves as the institutional headquarters and planning center for community socialization activities; and
SMK Vinama 2 Bekasi, located at Jl. Raya Kaliabang Tengah No. 20, Bekasi Utara District, which functions as the implementation site for the department's fire disaster socialization program.

The selection of SMK Vinama 2 was based on the school's proactive engagement in occupational safety education and its partnership with the Fire Department in promoting preventive awareness. The department's Prevention Division was chosen as the focal unit due to its responsibility for public education, socialization, and community training activities.

Participants (informants) were selected using purposive sampling, ensuring that individuals had relevant knowledge, experience, and involvement in the disaster socialization program (Alasian, 2021). The study involved six informants, consisting of:

One key informant: the Head of the Prevention Division;
Two supporting informants: operational staff from the Prevention Division;
One field practitioner: a firefighter from the Fire Suppression Division;
One teacher from SMK Vinama 2 Bekasi; and
One student representative (head of the student council/OSIS).

This composition allowed for a comprehensive understanding of both institutional communication strategies and audience reception during the socialization event.

Data Collection Techniques

Data were collected through triangulated qualitative methods—namely, observation, in-depth interviews, and documentation—to ensure the credibility and completeness of findings (Rizky Fadilla & Wulandari, 2023).

Observation

The researcher conducted direct observations during the socialization event to capture real-time communication processes and behavioral interactions between instructors and students. The focus included message delivery techniques, media use (e.g., video, printed materials), nonverbal communication, and students' engagement during simulations. This field observation allowed the researcher to analyze how theoretical models of communication were manifested in practice.

In-depth Interviews

Semi-structured interviews were carried out with the six informants mentioned above. The questions explored topics such as (a) communication planning, (b) message formulation, (c) methods of delivery, (d) audience response, and (e) evaluation of effectiveness. Interviews were recorded with consent and later transcribed for analysis.

Documentation

Supporting materials such as official letters, socialization agendas, photographs, educational brochures, and video clips from the Bekasi Fire Department were analyzed to complement field data. Documentation provided contextual understanding and validation of the observed communication patterns.

Data Analysis Procedure

Data were analyzed using the interactive model of Miles, Huberman, and Saldana (2014), consisting of three main stages:

Data Reduction: simplifying, organizing, and focusing on relevant data obtained from interviews, observations, and documents.

Data Display: presenting data in the form of narrative descriptions, matrices, or thematic summaries to identify recurring patterns and relationships.

Conclusion Drawing and Verification: interpreting the meaning of data and validating the conclusions through cross-checking with multiple sources.

This process was iterative, meaning analysis began concurrently with data collection. As themes emerged, they were compared across informants to develop a holistic picture of the communication system and its impact on student disaster literacy.

Validity and Reliability (Trustworthiness)

The trustworthiness of qualitative findings was ensured through triangulation, member checking, and source validation. Triangulation involved comparing data from three different methods—observation, interviews, and documentation—to confirm consistency (Mudjia, 2010). Member checking was performed by sharing summarized findings with key informants to verify accuracy and interpretation. Furthermore, cross-validation between staff and participants' perspectives helped minimize researcher bias and strengthen data credibility (Saadah et al., 2022).

Dependability was maintained through transparent documentation of the research process, including field notes and coding procedures. Confirmability was addressed by grounding interpretations in direct quotations and evidence rather than researcher assumptions. Transferability was considered by providing thick contextual descriptions so that findings could be applicable to other urban fire departments conducting similar disaster education initiatives.

Ethical Considerations

Ethical research principles were strictly followed throughout the study. All participants were informed about the research objectives and procedures and provided **informed consent** prior to participation. Identities were anonymized in the reporting process to protect confidentiality. The study adhered to academic research ethics emphasizing voluntary participation, privacy, and non-maleficence. Additionally, permissions were formally obtained from both the Fire and Rescue Department and SMK Vinama 2 Bekasi to conduct observations and interviews.

Research Timeline

Preliminary observations were conducted in September 2024 to identify potential research sites and establish communication with the Fire Department. Data collection took place between November and December 2024, coinciding with the department's socialization activities at SMK Vinama 2 Bekasi. The final data analysis and interpretation were completed in early 2025.

4. Results and Discussion

Result

Overview of the Research Site

The Bekasi City Fire and Rescue Department (FRD), headquartered in Harapan Indah, West Java, operates under the vision of "building a safe, orderly, and disaster-aware community." The department's Prevention Division is primarily responsible for educational outreach, inspections, and public engagement related to fire mitigation. Its mission emphasizes service improvement, fire prevention, and community empowerment.

One of the department's recurring initiatives is a school-based fire disaster socialization program, designed to enhance students' knowledge and readiness in responding to emergencies. The chosen implementation site, SMK Vinama 2 Bekasi, is a vocational high school that integrates occupational safety (K3) awareness into its curriculum. Given the hands-on nature of vocational training involving laboratory equipment, electricity, and mechanical tools, the school represents an ideal environment for disaster education.

Program Implementation: Fire Disaster Mitigation Socialization

The socialization program took place on 8 November 2024, organized by the Prevention Division in coordination with school authorities. Prior to implementation, a formal administrative process was carried out: the school submitted a written request, followed by approval and scheduling by the department. The department's head then issued an official letter of assignment to staff members and firefighters serving as instructors.

The session consisted of three stages:

1) Preliminary Briefing and Awareness Session – Department officials introduced fire hazards, causes of common fire incidents, and emergency procedures through oral presentation and video demonstrations.
2) Practical Demonstration – Firefighters demonstrated the correct use of fire extinguishers (APAR), hose handling, and emergency response drills.
3) Simulation and Participation – Students practiced evacuation procedures, human and animal rescue simulations, and teamwork coordination during mock fire situations.

According to field interviews, the department conducted similar socialization events throughout Bekasi's public schools as part of its annual prevention plan. However, the session at SMK Vinama 2 represented a more intensive collaboration due to the school's strong occupational safety culture.

Identified Communication Patterns

Based on the analysis, the socialization activities reflected three interrelated communication patterns consistent with classical communication theories (Shannon & Weaver, 1949; Schramm, 1972; McLuhan, 1964).

1) **One-way Communication Pattern**

At the initial stage, communication followed a **linear transmission model**, focusing on message delivery from instructors to participants. During lectures and video screenings, instructors provided structured explanations about fire hazards, legal frameworks, and safety equipment without immediate audience interaction.

This model was effective for disseminating standardized technical information—such as types of fires (Class A, B, C) and steps for extinguisher use—but lacked space for feedback or clarification. As observed, students tended to listen passively during this stage. However, as Shannon and Weaver (1949) noted, linear communication remains vital for efficiency and clarity when dealing with large audiences or standardized safety messages.

2) **Two-way Communication Pattern**

Interactive engagement emerged during question-and-answer sessions and practical demonstrations. Firefighters encouraged students to ask questions about the demonstration materials and respond to hypothetical scenarios ("What would you do if a fire breaks out in the lab?").

This stage corresponded to Schramm's (1972) two-way communication model, emphasizing mutual understanding through feedback. The communicators (firefighters) and receivers (students) alternated roles, exchanging messages and interpretations. Observational data revealed high engagement; students showed curiosity about real-life emergency responses, and firefighters provided contextualized examples.

This dialogical interaction significantly increased students' comprehension. As Schramm's model suggests, communication effectiveness depends on shared experience fields between sender and receiver. In this program, both groups shared practical contexts of safety, allowing a stronger connection between instruction and comprehension.

3) Multi-directional (Networked) Communication Pattern

The final phase involved multi-directional communication consistent with McLuhan's (1964) participatory media model. Communication was no longer hierarchical but circular and collaborative. During simulations, students not only received instructions but also coordinated among themselves—delegating roles such as leader, safety monitor, and rescuer. Firefighters and teachers acted as facilitators rather than sole information sources.

In this model, participants collectively created meaning through shared experiences. McLuhan's concept of the "global village" manifests here through collective problem-solving, where every participant contributes to the construction of disaster knowledge. This participatory approach improved not only understanding but also reflexive action, as students internalized safety behavior through practice rather than instruction alone.

The combination of these three communication modes formed a hybrid communication system—a continuum from knowledge transmission to active engagement. This structure enhanced both information retention and behavioral preparedness.

Thematic Findings

From the interviews and observations, four major themes emerged that explain how communication patterns shaped the effectiveness of the program.

1). Structured Institutional Communication

The Bekasi FRD utilized a hierarchical yet coordinated communication structure. Administrative correspondence ensured formal authorization, clear objectives, and logistical readiness. The department followed a chain-of-command model, starting from official circulars issued by the Head of Department to implementation at the Prevention Division level.

"Every year, we send out circular letters to schools and communities, inviting them to request fire prevention training," said *Aziz Muslim* (Head of Prevention Division, interview 10/12/2024).

This formalized process reflects bureaucratic communication efficiency, ensuring accountability and consistency across multiple schools and communities.

2). Communicative Role of Firefighters as Educators

Firefighters functioned not only as emergency responders but also as educators. During the session, they translated technical fire-safety knowledge into relatable examples and everyday practices. Their interpersonal approach fostered trust and engagement among students.

"It's not enough to just tell them what to do—we show them how to do it," explained Pery Periadi, field instructor (interview, 18/12/2024).

This dual role illustrates the transformative communication function, where professionals shift from authority figures to facilitators of learning (Dufty, 2020).

3). Student Engagement and Behavioral Change

Observation and follow-up interviews with students and teachers revealed tangible changes in students' awareness and behavior. Students demonstrated increased understanding of fire causes, emergency procedures, and teamwork importance.

"After the session, students were more aware of potential risks in our labs," said *Indah*, a teacher participant (interview, 11/12/2024).

This aligns with findings by Irawan et al. (2024), who observed improved knowledge retention following interactive fire safety training. In communication theory, such transformation signifies successful encoding-decoding alignment— where message interpretation matches intended meaning.

Institutional and Community Synergy

The collaboration between the Fire Department and SMK Vinama 2 exemplified inter-institutional communication synergy. Through joint planning, both parties shared ownership of the program's outcomes. The school provided facilities and participants, while the department provided technical expertise.

This partnership reflects the Engagement–Communication–Education (ECE) model proposed by Dufty (2020), emphasizing co-creation of knowledge between institutions and communities. The result was a mutually reinforcing relationship—students gained practical literacy, and the department strengthened its public credibility.

Discussion

The results of this research highlight how communication processes play a far more essential role in disaster education than previously assumed. While most disaster-related programs emphasize message delivery and technical preparedness, the Bekasi Fire and Rescue Department's initiative reveals that communication itself functions as the structural backbone of learning and behavioral transformation. The hybrid approach—integrating one-way, two-way, and multi-directional interaction—creates a layered process in which information is not only transmitted but interpreted, questioned, and internalized. This pattern of communication moves beyond instruction to participation, where meaning is co-created through shared experience.

The one-way communication used during lectures and presentations aligns with Shannon and Weaver's (1949) concept of linear message transmission. In this phase, firefighters delivered structured information about fire types, safety procedures, and response mechanisms. Although this approach may seem rigid, it remains an effective method for disseminating standardized and technical content to a large audience (Terpstra et al., 2017). The advantage of this model is clarity; however, it becomes limited if used alone, as it restricts feedback and audience interpretation. In the context of fire mitigation, this stage provided a necessary foundation of factual understanding for students who were largely unfamiliar with emergency terminology and protocol.

The second stage—two-way communication—represents a transition from passive to interactive engagement. In this process, firefighters encouraged students to ask questions and share prior experiences. Such interaction aligns closely with Schramm's (1972) notion that communication effectiveness increases when both sender and receiver share overlapping fields of experience. When students were given room to clarify procedures or recount personal safety encounters, comprehension improved visibly. The reciprocal dialogue allowed for verification, correction, and the formation of shared meaning. This interactional exchange transformed the session into a dialogic learning experience rather than a unidirectional transmission.

Finally, the multi-directional communication observed during simulations resonates strongly with McLuhan's (1964) concept of participatory communication in the "global village." At this point, both firefighters and students became co-participants in a live rehearsal of crisis response. Each group member contributed to decision-making—assigning roles, coordinating movements, and reflecting on outcomes. Rather than being merely instructed, participants experienced the practice of collective problem-solving. This participatory stage

proved to be the most effective in cultivating reflexive and collaborative attitudes, showing that communication serves not only to inform but also to construct behavioral readiness.

The integration of these communication stages created a dynamic learning ecosystem that continuously cycled between information delivery, mutual understanding, and active engagement. This cyclical structure embodies what Dufty (2020) calls the *Engagement–Communication–Education* (ECE) framework, in which communication is inseparable from educational participation. The case of SMK Vinama 2 Bekasi exemplifies how this model can be applied practically within a formal institution. It transformed traditional top-down instruction into a dialogic process involving teachers, students, and professionals in a shared experience of safety learning.

From a sociocultural standpoint, these interactions also strengthened the sense of community and responsibility among participants. Teachers reported that students began to take ownership of safety measures in laboratories and workshops, often reminding peers to follow proper procedures. Such behavioral shifts mirror findings from Ronan et al. (2015), who noted that participatory learning fosters long-term awareness and social resilience. The Bekasi program therefore demonstrates that disaster education works best when it allows participants to engage emotionally and socially—not merely cognitively—with the subject matter.

Additionally, the study reaffirms the importance of aligning educational initiatives with institutional policy. Indonesia's Law No. 24 of 2007 on Disaster Management places educational institutions at the core of preventive action. By collaborating with local schools, the Fire Department successfully translated this policy into an operational framework that can be replicated across urban areas. Similar to Winarni and Purwandari (2018), this partnership model situates schools as both learning centers and communication hubs for community resilience.

From a theoretical lens, these findings reinforce McLuhan's (1964) assertion that *the medium is the message*. The form of communication—interactive socialization—became as crucial as the content itself. In Bekasi's case, the "medium" was experiential learning; the message of preparedness gained power through the practice of collaboration. Students did not simply receive information—they enacted it. This transformation from knowing to doing indicates that disaster communication must be understood as a **performative process**, where understanding and action merge.

In summary, the Bekasi Fire and Rescue Department's hybrid communication model demonstrates that disaster literacy develops through interconnected phases of learning and interaction. One-way methods build the informational base, two-way dialogue ensures comprehension and feedback, and multi-directional engagement embeds learning through experience. Together, these layers form a comprehensive strategy for shaping preventive behavior and cultivating a sustainable culture of safety.

5. Comparison

The current study advances existing research by positioning communication not merely as a delivery channel but as an active component of disaster education. Prior studies such as Andini et al. (2020) and Firman et al. (2023) provided essential groundwork on fire prevention and early-age education but relied heavily on one-way dissemination models. In contrast, the Bekasi case demonstrates that communication becomes most effective when it evolves toward interactivity and shared authorship.

Irawan et al. (2024) quantitatively confirmed that disaster education increases student comprehension from 63 % to 92 %, yet their analysis stopped short of explaining *how* communication patterns facilitate that change. This research fills that gap by illustrating the communicative dynamics behind knowledge gain—how interaction, participation, and simulation jointly influence learning outcomes.

The study also operationalizes Dufty's (2020) ECE framework, which had remained largely conceptual. By applying it empirically in a formal school context, this research validates the interplay between engagement, communication, and education. Similarly, the hybrid model observed in Bekasi complements the participatory approach suggested by Ronan et al.

(2015) but extends it further through structured multi-stage communication that begins with one-way instruction and culminates in collaborative action.

Compared with Waluyo et al. (2024), who examined communication in forest-fire management among community groups, the current study focuses on institutional education, where the participants are students and teachers rather than residents. This shift from community-based to school-based contexts highlights a new dimension of disaster communication: the pedagogical structuring of participation. While Waluyo et al. emphasized inter-agency coordination, this research emphasizes internal dialogue and behavioral formation within learning environments.

The study by Kimura and Aikawa (2024), which proposed disaster-management drills for high-school students in Japan, shares similarities with the Bekasi case in its emphasis on experiential learning. However, the Japanese model centers on simulation design, whereas this research situates simulation within a broader communicative framework that includes message framing, interaction, and reflection. Likewise, Parrott et al. (2024) explored resilience through the perspectives of teachers and caregivers, but the present study contributes empirical evidence on how such conceptualizations can be fostered directly through structured communicative engagement.

When compared to the literature on disaster communication reviewed by Ode Sitti Nurhaliza et al. (2024) and Pradipta et al. (2024), this research adds specificity by connecting theoretical communication models to tangible pedagogical practices. Whereas prior works often treated education and communication as parallel themes, this study demonstrates their inseparability. The hybrid communication model thus serves as a bridge between abstract theory and field application.

Overall, the study enriches the state-of-the-art by introducing an empirically grounded framework that:

1. Integrates multiple classical communication theories into a single operational model;

2. Validates the ECE conceptual structure within a real educational institution;

3. Extends participatory communication theory into structured disaster-learning environments; and

4. Provides a replicable model for other cities seeking to strengthen disaster preparedness through education.

By addressing both theoretical and practical gaps, this research positions itself as a pivotal link between communication theory and disaster-risk education, contributing to the global discourse on how interaction and participation can build sustainable resilience.

6. Conclusions

This study has demonstrated that disaster communication in educational contexts must be understood as a continuous, participatory, and adaptive process rather than a linear transmission of information. The findings from the Bekasi Fire and Rescue Department's fire mitigation program at SMK Vinama 2 reveal that communication operates not merely as a conduit for message delivery but as a transformative mechanism that shapes understanding, emotional engagement, and collective action. The hybrid communication model—incorporating one-way, two-way, and multi-directional patterns—illustrates a comprehensive framework in which knowledge, experience, and collaboration converge to cultivate disaster literacy and resilience among students.

At the foundational level, one-way communication remains essential for disseminating accurate and standardized safety information. It ensures that critical messages are delivered clearly and uniformly, particularly during early stages of education or when addressing large groups. However, this approach becomes truly effective only when embedded within a broader communicative structure that welcomes feedback and participation. The addition of two-way communication provides the necessary dialogic space for clarification, trust-building, and cognitive verification. Students become co-learners rather than passive recipients, reflecting Schramm's (1972) notion that effective communication depends on shared experience and mutual understanding.

The most significant innovation arises at the level of multi-directional communication, which transforms disaster education into a collaborative performance. Through interactive simulations, students and instructors engage in co-decision-making, reflection, and peer coordination. This process not only strengthens procedural knowledge but also builds social bonds and emotional awareness—two components often missing in top-down disaster-education approaches. In alignment with McLuhan's (1964) idea that "the medium is the message," the form of interaction becomes as important as the content conveyed. When communication occurs through experience and collective participation, the message of preparedness becomes internalized, sustained, and practiced.

Theoretically, this study expands the Engagement–Communication–Education (ECE) model proposed by Dufty (2020) by grounding it in empirical observation. The integration of classical communication models—Shannon and Weaver's (1949) linear theory, Schramm's (1972) feedback model, and McLuhan's participatory framework—demonstrates that these theories can coexist and complement one another when adapted to real-world disaster contexts. This synthesis positions communication not at the periphery of disaster education but at its conceptual core. The hybrid participatory model validated here provides an alternative lens for understanding how resilience can be cultivated through communicative structures rather than merely through content dissemination.

Practically, this research offers a replicable framework for educational institutions, government agencies, and local communities. Schools, as mandated by Indonesia's Disaster Management Law No. 24 of 2007, can adopt similar models to translate policy into practice through systematic partnerships with local fire and disaster management departments. The findings suggest that participatory and context-based communication strategies yield greater behavioral impact than conventional lecture-based programs. Beyond disaster readiness, the model encourages intergenerational dialogue and civic responsibility, embedding preparedness into the cultural fabric of the community.

The implications extend internationally as well. The Bekasi case demonstrates that disaster-education communication models can be adapted across socio-cultural contexts when grounded in participatory principles. Future research may explore how this hybrid model functions in different environments—rural areas, coastal regions, or among other age groups—to assess its scalability and adaptability. Furthermore, quantitative assessment of behavioral change over time could strengthen the empirical validation of the model and offer comparative insights with other nations' frameworks such as Japan's simulation-based drills (Kimura & Aikawa, 2024) or Australia's community engagement approaches (Dufty, 2020).

Despite its contributions, this study recognizes certain limitations. The research was conducted within a single institution and focused primarily on qualitative data. Broader studies incorporating diverse school types and demographic groups could reveal variations in communication patterns and their corresponding impacts. Additionally, longitudinal tracking of students' preparedness behavior could provide richer understanding of how communication-based interventions influence resilience in the long term.

In conclusion, this study stands at the intersection of communication science and disaster education, offering both theoretical advancement and practical utility. It confirms that effective disaster education emerges not merely from what is taught but from how it is communicated, experienced, and shared. The hybrid participatory communication model developed here underscores that communication is not only the *medium* through which preparedness is expressed but the *mechanism* through which resilience is built. As communities continue to face escalating disaster risks, particularly in urban areas, such models of integrative and participatory communication will be essential in fostering informed, cooperative, and adaptive societies prepared to confront the uncertainties of the future.

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