

A Content Analysis of Digital Edutainment for Disaster Literacy in Higher Education

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Abstract

Disaster literacy is a crucial competency for communities at risk of natural hazards, especially for higher education students who will significantly contribute to future preparedness efforts. This research aimed to examine the efficacy of digital edutainment, including films and interactive content on platforms such as YouTube, TikTok, Instagram, and Coursera, in improving disaster literacy. We conducted a qualitative content analysis of materials concerning disaster knowledge, attitudes, and practical skills pertinent to mitigation and emergency response. Results indicate that edutainment effectively enhances foundational knowledge and promotes proactive attitudes; however, practical skills, including evacuation procedures and preparedness drills, are inadequately represented. It is advisable to collaborate with scientific agencies such as BMKG and BNPB to ensure the accuracy and relevance of content. This research emphasises the importance of incorporating edutainment into higher education curricula as an effective combination of learning and entertainment, supporting a comprehensive approach that integrates knowledge, attitudes, and skills to enhance societal preparedness for future disasters.

Keywords: Disaster literacy, Edutainment, Higher education, Disaster mitigation, Digital learning material.

INTRODUCTION

The increasing frequency of natural and social disasters in recent decades has heightened the demand for disaster literacy among various populations. Disaster literacy includes essential knowledge about the types and causes of disasters, as well as a comprehensive understanding of effective mitigation, response, and recovery measures (Djalante, 2018). Integrating disaster literacy into formal education at all levels, including higher education, has become a vital concern, especially in disaster-prone countries such as Indonesia (Mikami et al., 2014; Nakano et al., 2020). Education centred on disaster literacy is an essential tool for enhancing community resilience, particularly by promoting active engagement in mitigation strategies and emergency response activities (Ssenoga et al., 2022; Chen et al., 2021; Chung, S.C. & Yen, 2016; Brown et al., 2014).

Research in Indonesia demonstrates that improving disaster literacy directly affects community preparedness. In West Java, augmented disaster literacy increased community preparation by up to 45% (Marlyono, 2016). The integration of disaster literacy education through the Tri Sentra Pendidikan approach, encompassing families, schools, and communities, has shown improved and more effective information transmission (Prakoso et al., 2021). In the coastal areas of Pangandaran, disaster literacy significantly enhances students' readiness for tsunami mitigation, designating elementary and secondary school students as "prepared" and high school students as "nearly prepared" (Nuraziz et al., 2023; Marlyono and

Siliwangi, 2019; Pandu J. Sampurno et al., 2015).

In areas such as the Mount Merapi region, disaster risk reduction forums have improved disaster literacy, resulting in increased community understanding and readiness (Septiyani et al., 2024). The results indicate that disaster literacy increases community understanding of catastrophe risks and promotes enhanced emergency response strategies (Afrian and Islami, 2019). The incorporation of digital edutainment in disaster literacy training has proven helpful, as content analysis reveals increased engagement and information retention among higher education students. (Prasetyaningsih et al., 2024).

Disaster literacy, encompassing the skills to prepare for, respond to, and recuperate from disasters, is a crucial element of education in countries frequently affected by natural disasters (Arai et al., 2023; Kitagawa, 2021; Vu et al., 2023). Disaster literacy encompasses the fields of science, technology, and educational policy. To create resilient communities capable of withstanding calamities, collaboration among all three sectors is essential to enhance the curriculum, engage individuals, and foster international cooperation (Prasetyaningsih et al., 2025). The socio-cultural environment also affects the development of a unique framework for understanding and applying mitigation skills (Burch and Robinson, 2015; Van Kerkhoff and Pilbeam, 2017). Innovative projects like Sekolah Gunung Merapi underscore the importance of integrating disaster literacy into the curriculum using multidisciplinary approaches and modern media, such as educational videos and

simulation games (Minanto and Ningsih, 2018).

College students are essential to the future of disaster mitigation, rendering disaster literacy a vital skill for the younger generation. Disaster literacy among Indonesian university students is considered to be at an intermediate to low level (Lathifa and Putra, 2022; Suka et al., 2021). Despite multiple studies indicating that pupils have adequate knowledge of disaster mitigation (Nurjanah and Mursalin, 2021) Improving this literacy should prioritise more engaging approaches, including the use of digital and social media as educational instruments (Lathifa and Putra, 2022).

An effective strategy is edutainment, which combines instruction and entertainment through a digital medium. Edutainment has proven effective in improving student engagement and understanding in various educational contexts, including disaster literacy (Klobas et al., 2018; Moghavvemi et al., 2018b). Edutainment films, which encompass animations, simulations, and instructional content, effectively convey substantial knowledge interactively and engagingly, promoting the assimilation of educational materials. The use of these films is relevant in the modern digital era because technological accessibility is becoming common, enabling the effective distribution of educational content (Haristiani et al., 2023; Park, 2020).

Edutainment films can improve disaster literacy in children by utilising a visual and narrative approach that combines fun with education. This study analyses edutainment video content employed as a resource for disaster literacy instruction, specifically in higher education. Edutainment platforms such as

Coursera, Khan Academy, and National Geographic offer accessible educational resources, improving disaster literacy through a more interactive approach.

Digital edutainment has arisen as an efficacious pedagogical method that amalgamates educational content with engaging digital media formats, including animated movies, interactive simulations, and gamified learning modules. Multiple studies emphasise its ability to improve learner engagement, knowledge retention, and motivation in disaster literacy instruction among various age demographics (Lichao and Desa, 2024; Nyirahabimana et al., 2023; Moghavvemi et al., 2018a; Klobas et al., 2018). Most of the research concentrates on children and informal learning contexts, leaving the use of digital education insufficiently examined, highlighting a considerable deficiency in both theoretical comprehension and empirical validation of its efficacy among university students.

Despite increasing interest in edutainment as a mechanism for disaster literacy, a theoretical and practical gap persists in comprehending its efficacy within higher education settings. Prior research has predominantly concentrated on general educational environments for younger learners, resulting in scant empirical information about the influence of edutainment on disaster literacy advancement among university students. Furthermore, thorough content analysis is absent regarding edutainment products designed for disaster education, and limited research has explored the systematic incorporation of these resources into formal higher education curricula.

This study seeks to investigate the following research question: (RQ1) What

is the efficacy of edutainment films in improving disaster literacy among higher education students? RQ2: What are the essential attributes of edutainment video content that enhance disaster literacy? RQ3: How can edutainment resources be effectively integrated into higher-level disaster literacy curricula?

This research aims to connect theoretical discourse with practical application by giving evidence-based suggestions for educators and policymakers regarding the incorporation of digital edutainment in tertiary disaster education.

METHOD

This study utilized a qualitative content analysis method (see Figure 1), employing a structured observation sheet to analyze edutainment movies centered on disaster literacy. The analysis employs descriptive and evaluative methods to examine three fundamental elements of disaster literacy—knowledge, attitudes, and skills—within digital media content (Stewart et al., 2015).

A selective sample of 30 films was chosen from four internet platforms: YouTube, Instagram, TikTok, and specialist educational websites. The sampling period extended from January to April 2025. The inclusion criteria were: (1) a clear emphasis on disaster mitigation topics (e.g., earthquake safety, tsunami preparedness); (2) publicly accessible content devoid of paywalls or registration requirements; (3) educational purpose appropriate for formal or informal disaster literacy education; and (4) publication within the last five years (2020–2025) to maintain contemporary relevance. Videos devoid of explicit disaster literacy themes or mostly intended for enjoyment were removed. Data collection began with

keyword searches in English and Indonesian, such as “disaster preparedness,” “tsunami mitigation,” “earthquake safety,” and “literasi bencana.” After screening titles and descriptions, selected videos were downloaded in MP4 format and cataloged with metadata including title, source, upload date, and duration.

The content analysis employed a manual coding method utilizing a pretested content observation form. This process included open coding to pinpoint occurrences of disaster literacy indicators in narrative and visual segments, axial coding to categorize related codes into subthemes (e.g., factual information, emotional appeals, practical demonstrations), and selective coding to consolidate subthemes under the three primary categories: knowledge, attitudes, and skills. Themes were developed through a process of iterative evaluation and refining until saturation was achieved. All coding procedures were recorded in a codebook that includes code definitions, illustrations, and decision criteria. Two independent observers manually coded the films, documenting occurrences on the observation sheet and marking timestamps for validation.

Inter-coder dependability was established by having both observers separately code all 30 videos. The calculation of Cohen’s Kappa coefficient yielded a value of 0.82, signifying strong agreement. Discrepancies were addressed through dialogue, and final coding determinations were corroborated by a disaster education specialist to reduce subjectivity.

The study performed a comparative analysis of edutainment platforms (YouTube, TikTok, and

educational websites) beyond mere descriptive summaries, focusing on content depth (duration of factual segments), accuracy (conformity with BMKG and BNPB official guidelines), and learning potential (inclusion of interactive or participatory elements). The narrative tactics (story arcs, character-driven scenarios), visual strategies (infographics, animations), utilization of humor, and cultural relevance were rigorously analyzed to determine if the content promotes profound disaster literacy (application and skill development) instead of superficial awareness.

Video sources were classified into governmental (e.g., BMKG, BNPB), academic (university channels),

commercial (media corporations), and user-generated content (individual creators). Each source was assessed for credibility (verification of the uploader's identity and affiliation), scientific accuracy (alignment with peer-reviewed or government catastrophe protocols), and potential bias (commercial or ideological motivations). Credibility evaluations were conducted by cross-referencing video information with official BMKG/BNPB publications and consulting experts. Videos featuring unverifiable assertions or substantial falsehoods were identified and examined in the interpretation section to contextualize their educational merit.

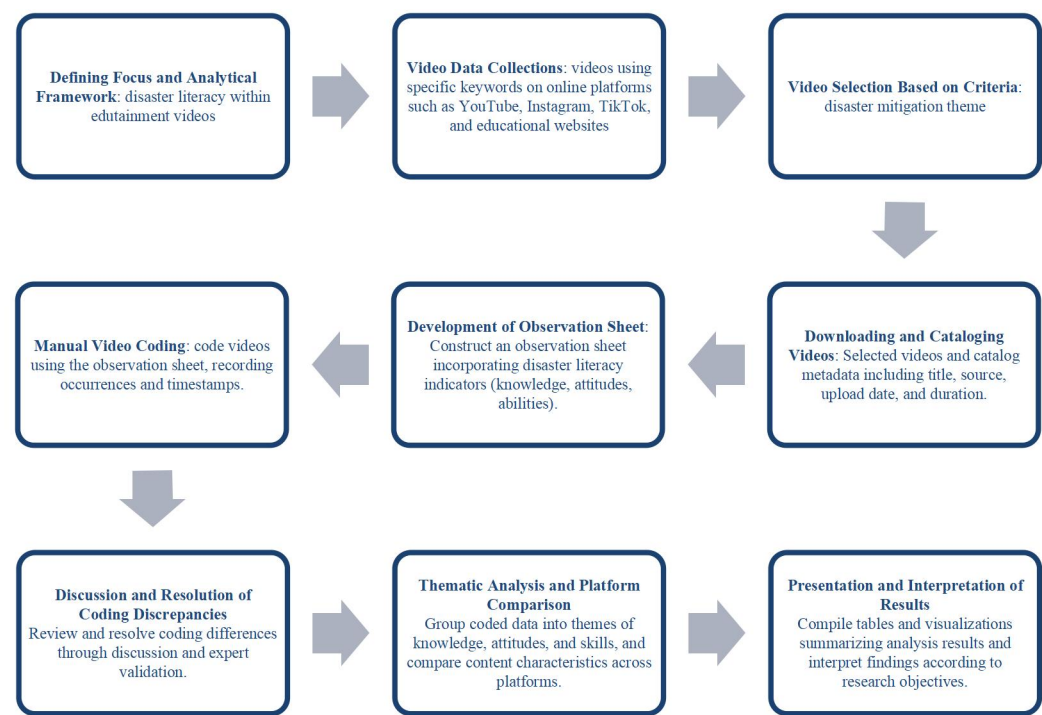


Figure 1. The flowchart of the employed analysis

RESULT AND DISCUSSION

A. Digital Platform Disaster Literacy

This study aimed to analyze disaster literacy content delivered via edutainment media. This analysis will focus on three main categories: online instructional resources, social media platforms with disaster-related content, and films defined by the framework of

disaster literacy. This analysis will present data in three tables: Table 1. Digital Educational Materials for Disaster Literacy; Table 2. Social Media Applications with Disaster Content; and Table 3. Film Analysis Data Based on the Conceptual Framework of Disaster Literacy.

Table 1. Digital Educational Materials for Disaster Literacy

Educational Materials	Concise Overview	Type of content	Quality of content	Accessibility
https://www.coursera.org/	A digital learning platform that provides a diverse range of subjects, including natural disasters. Coursera Inc., established in 2012 by Andrew Ng, a computer science professor at Stanford University, and Daphne Koller, is the preeminent supplier of free online courses in the United States. Coursera collaborates with universities and other organizations to offer online courses, certificates, and credentials across diverse disciplines. By 2021, it is anticipated that 150 universities will provide over 4,000 courses on Coursera.	Video lectures, written articles, assessments, and tasks	Premium (material produced by leading universities and institutions)	Excellent (accessible at no cost or with a designated course fee)
https://www.khanacademy.org/	Complimentary educational platform encompassing a diverse array of subjects, including earth and environmental science. Khan Academy provides practice questions, instructional videos, and a customized learning dashboard that enables students to learn at their speed, both in and outside the classroom. Collaborates with organizations including NASA, The Museum of Modern Art, The California Academy of Sciences, and MIT to provide specialized content. Instructional videos, practice exercises, and scholarly articles Superior (formulated by educational specialists and consistently evaluated material) Excellent (complimentary and readily accessible)	Instructional videos, practice inquiries, and articles	Advanced (created by educational specialists, and the material is consistently evaluated)	Excellent (complimentary and readily accessible)
https://thecrashcourse.com/	An educational YouTube channel encompassing diverse topics, such as science and geography. Crash Course, developed by Hank Green and John Green, was among the initial 100 YouTube videos addressing subjects including Biology, World History, Ecology, English Literature, Chemistry, and US History. It was inaugurated on December 2, 2011.	Concise videos that are both educational and engaging	Elevated (recognized for captivating and superior delivery)	Excellent (available for free on YouTube)
https://bnpb.go.id/	According to Law Number 24 of 2007 on Disaster Management, the National Disaster Management Agency (BNPB), referenced in this Presidential Regulation, is a non-departmental government entity that operates under the direct authority of the	Articles, reports, infographics, and videos.	Extremely high (official information from sanctioned government entities)	Beneficial (complimentary access, albeit occasionally more technical information)

Educational Materials	Concise Overview	Type of content	Quality of content	Accessibility
https://www.bmkg.go.id/	President. The Meteorology, Climatology, and Geophysics Agency (BMKG), previously referred to as the Meteorology and Geophysics Agency (BMG), is a non-ministerial government agency (LPNK) in Indonesia tasked with executing governmental responsibilities in meteorology, climatology, air quality, and geophysics.	Articles, meteorological reports, alerts, and instructional videos	Extremely elevated (official material from sanctioned government entities)	Beneficial (complimentary access, however, necessitates a fundamental comprehension of technical terminology)
https://education.nationalgeographic.org/	A National Geographic educational portal addressing environmental and natural disaster subjects. National Geographic Magazine, previously referred to as the National Geographic Magazine, serves as the official publication of the National Geographic Society. It commenced publication in 1888. Most of the articles in the journal pertain to global geography, history, and culture. It is issued monthly and is accessible both online and in print. In 2011, National Geographic Magazine was published in 40 languages and had a global circulation of 8.3 million copies.	Videos, essays, interactive maps, and further educational resources	Premium (premium content from environmental and geographic specialists)	Excellent (complimentary and readily accessible)

The findings reveal that numerous digital learning platforms provide a variety of educational materials for disaster literacy, differing in content type, quality, and accessibility. Platforms like Coursera and Khan Academy offer high-quality resources through partnerships with esteemed educational institutions and the engagement of subject matter experts. Simultaneously, platforms such as Crash Course provide succinct and captivating films that successfully engage a wider audience via an informal and interactive methodology.

Official sources from government agencies like BNPB and BMKG provide significant authority and accuracy, while their material is often technical and may necessitate expert comprehension. Conversely, the National Geographic educational portal enhances value by

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offering premium, interactive information centered on environmental and disaster themes, so enhancing users' viewpoints with reliable and authoritative resources.

These findings corroborate prior research indicating that high-quality, readily accessible digital learning resources are essential for improving public awareness and knowledge regarding disasters (Rahmani et al., 2021; Stone et al., 2021). Khan Academy and Coursera are acknowledged as good platforms for informal education, as they cater to various learning styles and offer flexible learning experiences (Vidergor and Ben-Amram, 2020).

This study's novel contribution is its thorough identification of the characteristics and accessibility of digital edutainment materials related to disaster literacy, specifically in Indonesia. This

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approach demonstrates the potential of employing diverse sources that integrate both formal elements and aspects of entertainment and interactivity to enhance the effectiveness of disaster education outreach. The results support the assertion that the integration of multiple digital platforms provides a more comprehensive and adaptable learning experience customized to user requirements.

Several limitations must be acknowledged. The analysis is primarily descriptive and lacks empirical measurement of the effectiveness of each platform in enhancing users' disaster literacy. The technical complexity of

governmental content from BNPB and BMKG may limit optimal access and utilization by specific users. The generalizability of these findings is limited to the analyzed platforms and does not include all available digital learning resources.

Future research should empirically assess the effectiveness of these platforms using surveys or experimental studies that involve direct user engagement. The development of content that employs inclusive and user-friendly approaches is recommended to enhance the reach of disaster literacy education to a broader and more diverse population segment.

Table 2. Social Media Platforms Featuring Disaster-Related Content

Application Title	Provider URL
Youtube	https://www.youtube.com/@bnpb_indonesia https://www.youtube.com/@InfoBMKGIndonesia https://www.youtube.com/@coursera https://www.youtube.com/@crashcourse https://www.youtube.com/@khanacademy
Instagram	Infobmkg. Bnpb_indonesia; BPBD (Provinsi dan Kabupaten); BPPTKG Kabar geologi (Badan Geologi_KESDM) Dongeng Geologi (Media kebumian di Indonesia sejak 2000 oleh Rovicky Putrohari DaryonoBMKG (Ilmuwan, Kepala Pusat Gempa Bumi dan Tsunami) Marufin Sudibyo (Peneliti di Badan Pengelola Geopark Nasional Karangsambung, Karangbolong; Juru bicara Tanggap Bencana Kebumen) Yuk siaga bencana Krakatau_ca_cal(Dikelola Sosmed KPHK Lampung, BKSDA Bengkulu Lampung)
Tik Tok	Info BMKG; bnpb_indonesia; BPBD Prov. Jatim; BPBD Tabalong; BPBD Jateng; Bpbd Sidoarjo; bpbdd_malangkota; BPBD Kota Tangerang; BPBD Tajungbalai, Sumut; BPBD Kota Blitar; bpbdd_ciamis; BPBDSUMEDANG; BPBD Bondowoso; BPBD LOMBOK TENGAH; BPBD Bantul; BPBD Provinsi Jawa Tengah; BPBD KAB PATI; BPBD Pasaman; BPBD KOTA TANGERANG; BPBD KABUPATEN PANGANDARAN; BPBD PELALAWAN; bpbdd_semarang; BPBD SUBANG JAWARA; BPBD Sragen; bpbdd Pamekasan; BPBD KAB. MADIUN; BPBD DKI Jakarta; BPBD KAB. PONOROGO; BPBD KEBUMEN; bpbddklaten; BPBD Kabupaten Bekasi; BPBD.Lumajangkab; BPBD Kab. Pacitan; BPBD Meranti; BPBD KOTA BOGOR; BPBD_PROV_NTT; BPBD KOTA MADIUN; BPBD Kabupaten Sleman; BPBD KOTA TEGAL; bpbddkabupatentuban; Officialbpbdsurabaya; BPBD KABUPATEN BOJONEGORO; BPBD Pessel; BPBD Provinsi Sumatera Utara; BPBD Kota Kediri; BPBD KUNINGAN; BPBD Kabupaten Mojokerto; bpbddkabupatencianjur; BPBD Kab Probolinggo; BPBDJOMBANG; BPBD HSU; BPBD Kota Batu; BPBDKab.Kudus; BPBD KAB PURWAKARTA; Bpbd Kabupaten Jember; BPBD Kab.Ngawi; bpbddbanten; Bpbd gianyar; bpbddsampang; Bpbd Kesbangpol Pdng; BPBD_ACEH TAMIANG; BPBDBanjarbaru; BPBD Kota Payakumbuh; Official BPBDkuansing; bpbddkotasungaipenuh_official; bpbddkabtassikmamalaya; BPBD MANDAILING NATAL; BPBD Sarolangun; BPBDdanDAMKAR KAB. KARIUMUN; BPBD KABUPATEN BLITAR

Government entities, including the National Disaster Management Agency (BNPB) and the Meteorology, Climatology, and Geophysics Agency (BMKG), are progressively employing social media platforms like YouTube, Instagram, and TikTok for educational initiatives and the distribution of disaster-related information. YouTube channels such as @bpbd_indonesia and @InfoBMKGIndonesia often provide instructive videos on disaster management and early warning, facilitating a thorough visual comprehension for the audience (Dores, 2021; Lopezosa, Orduña-Malea and Pérez-Montoro, 2020; Maziriri, Gapa and Chuchu, 2020; Wamsler *et al.*, 2018;). Furthermore, the Instagram platform facilitates the rapid and visual dissemination of information (Abu-Alsaad and Al-Taie, 2021; McCrow-Young, 2021; Leaver, Highfield and Abidin, 2020), which is essential in crises. Certain accounts, such as Dongeng Geologi and Marufin Sudibyo, convey geological knowledge through a personalized scientific approach, thereby augmenting public awareness of disaster risks.

Concurrently, TikTok has surfaced as an attractive platform for governmental organizations to connect with younger audiences through creative and easily available content. Various BPBD accounts throughout Indonesia using TikTok to convey disaster management information concisely and effectively. Employing social media for disaster education allows organizations to dynamically and innovatively engage various societal segments.(Tarnoto, Yuniawati and Wijayati, 2023; Canbolat, 2023; Journalism and Security, 2023; Basch *et al.*, 2022; Banerjee and

Sathyanarayana Rao, 2020; Goldgruber *et al.*, 2018). Nevertheless, apprehensions encompass the growth of misinformation and hoaxes that also arise. Therefore, authorities must ensure the veracity of disseminated information and encourage the public's critical assessment of received data. Employing interactive components such as live streaming, Q&A sessions, and influencer partnerships can augment community engagement, rendering social media a novel tool for crisis management in the digital era.

The study findings suggest that most of the analyzed films and videos provide a rather comprehensive comprehension of the origins and impacts of natural disasters (knowledge dimension). Films such as *The Day After Tomorrow* provide insights into climate change and global disasters, but some dramatizations are somewhat overblown. Documentaries such as *An Inconvenient Truth* elevate public awareness about the importance of climate change mitigation.

Documentaries such as *Before the Flood* and *Earthquake: catastrophe in Japan* underscore the importance of catastrophe preparedness. Nonetheless, some fictitious films, such as *San Andreas*, showcase an excess of visual effects while lacking practical guidance on disaster management (Baggaley, 2020; Hansson *et al.*, 2020). Educational films produced by institutions such as BMKG and BNPB usually highlight skills related to disaster preparedness drills and response behavior. These films present explicit catastrophe management protocols, encompassing evacuation and mitigation techniques. Unfortunately, fictional films emphasize action and dramatization at the expense of this element (Huang *et al.*, 2021).

The examined edutainment video platforms included Coursera, YouTube (BNPB, BMKG, National Geographic), as well as several documentaries and films from diverse sources. These films depict various natural disasters, including earthquakes, tsunamis, volcanic eruptions, hurricanes, wildfires, and floods. Each film aims to improve disaster literacy among the public by providing knowledge on the definition, causes, impacts, preparedness, and reaction to disasters.

Video	Indicator Coding	Yes/ No	Notes
The Day After Tomorrow	KB1	Yes	Shows extreme climate change, although some elements are exaggerated from a scientific point of view.
	KR2	No	More focus on the impact of disasters than on rescue measures.
	SKP1	Yes	Awareness is raised even though some elements are considered unrealistic.
	SNP1	Yes	The film raises awareness of the impacts of climate change.
An Inconvenient Truth	KB3	Yes	The documentary by Al Gore presents scientific evidence of global climate change.
	SKP1	Yes	This documentary raises global awareness about climate change.
	SNP1	Yes	An approach that some critics have deemed too one-sided.
Into the Inferno	KB1	Yes	Combining science with cultural and spiritual aspects.
	SKP1	Yes	Explain the cultural and spiritual impacts of volcanoes.
Before the Flood	KB4	Yes	This documentary is very informative, with interviews with experts.
	SKP1	Yes	Featuring stunning visuals and interviews with experts.
Earthquake: Disaster in Japan	KR1	Yes	Provides an in-depth look at major disasters, especially those caused by earthquakes.
	SKP2	Yes	This documentary has an empathetic approach to disaster victims.
The Impossible	KB1	Yes	It is based on a story about a family separated by a tsunami.
	SKP1	Yes	The focus on white families has been widely criticized for ignoring the plight of local communities.
San Andreas	KR1	No	This film offers thrilling action with spectacular but less realistic visual effects.
	SKP1	No	The rescue scenario ignores many scientific aspects.
2012	KB1	Yes	Featuring extraordinary visual effects that seem excessive and have little basis in scientific phenomena.
Dante's Peak	KB2	Yes	Depicts the tension related to the threat of a volcanic eruption.
Twister	KB2	Yes	Providing an in-depth look into the world of storm chasers.
After the Wave	KB2	Yes	Presenting a moving true story with a moving perspective.
Memorizing Delisa's Prayer	KB2	Yes	Describes personal resilience and struggle based on religious aspects.
Earthquakes 101 and Volcanoes 101	KB1	Yes	Explaining the definition and causes of earthquakes and volcanic eruptions.
Tsunamis 101 and Wildfires 101	KB2	Yes	Explaining the impacts and dangers of tsunamis and forest fires.
Mitigation Against Earthquakes from BMKG	KK1	Yes	Provides a complete guide to earthquake preparedness.
Coursera: Disaster Preparedness'	KK2	Yes	Includes mitigation and preparedness action plans that course participants can follow.
Video from BMKG and National Geographic	KR2	Yes	Demonstrates emergency response steps for various natural disasters.
Earthquakes 101 and	KR2	Yes	Explaining the importance of awareness of

Video	Indicator Coding	Yes/ No	Notes
Volcanoes 101			the potential dangers of natural disasters.
Video from BMKG and BNPB	KR2	Yes	Emphasizing the importance of a proactive attitude towards disaster information.
Earthquake Mitigation Video from BMKG	SNP1	Yes	Emphasizing the importance of disaster prevention education.
	SNP2	No	The video does not explicitly explain the relationship between disaster prevention and social costs.
Video from BMKG and BNPB	SRTP1	Yes	Often emphasize the importance of prevention in schools and communities.
	SRTP2	No	The video does not specifically show campus evacuation planning or shelter placement.
	TK1	No	The video does not specifically show escape routes and shelters during a disaster.
	TK2	No	The video does not show participation in disaster prevention drills and training.
Video from BMKG and BNPB	TPR1	Yes	Guides steps for personal safety and helping others during a disaster.
	TPR2	No	The video does not specifically show cooperation during the evacuation and shelter placement.

CODING:		
Knowledge of Disasters (KB)		Attitude: Prevention Values (SNP)
KB1: Describe the definition and causes of disasters		SNP1: Emphasize the importance of disaster prevention in education
KB2: Explain the impact of disasters on humans and the environment		SNP2: Linking disaster prevention to social costs
KB3: Show scientific evidence related to the causes of disasters		
KB4: Shows potential hazards and disaster risks in the future		
Knowledge of Preparedness (KK)		Attitude: Sense of Responsibility for Prevention (SRTP)
KK1: Explain mitigation and preparedness procedures		SRTP1: Demonstrate disaster prevention promotion in the community or school
KK2: Shows preparedness steps in facing disasters		SRTP2: Demonstrates evacuation planning and shelter placement.
Knowledge of Response (KR)		Skills: Preparedness Action (TK)
KR1: Demonstrates rescue steps		TK1: Shows escape routes and safe places during a disaster.
KR2: Explain emergency response procedures after a disaster		TK2: Demonstrate participation in disaster prevention drills
Attitude: Prevention Awareness (SKP)		Skills: Behavioral Response (TPR)
SKP1: Raising awareness of the importance of disaster prevention		TPR1: Demonstrate steps for personal safety and help others
SKP2: Demonstrate empathy towards disaster victims		TPR2: Demonstrate cooperation in evacuation during a disaster

Figure 2 presents the percentage distribution of disaster literacy categories analyzed in edutainment videos based on the disaster literacy framework.

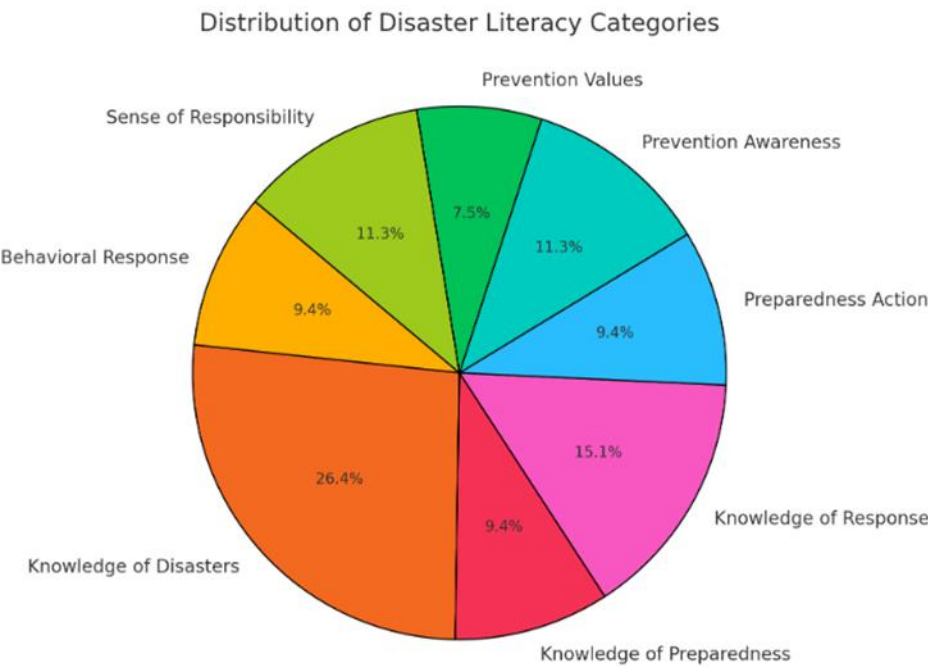


Figure 2. Analysis of videos based on the disaster literacy framework.

Knowledge of Disasters - 26.4%

The largest part of the pie chart pertains to the Knowledge of Disasters category, indicating that disaster literacy materials primarily focus on the cognitive dimension. This may include essential information such as definitions, causes, effects of disasters, and potential future threats.

The substantial degree of catastrophe knowledge indicates that a foundational understanding of disasters is considered crucial in disaster literacy education. This supports the view that information is essential for cultivating awareness and executing preventive measures in disaster management. Understanding disaster hazards and their sources can improve individual readiness for disaster response (Settembre-Blundo *et al.*, 2021; Comfort *et al.*, 2020; Dai *et al.*, 2020; Duan *et al.*, 2020).

Knowledge of Response - 15.1%

This category signifies a significant sector, reflecting efforts to educate individuals on disaster mitigation techniques and preparedness protocols. Comprehension preparation is essential for reducing risk through anticipatory actions. Paton and Johnston's research demonstrates that preparedness information empowers individuals to make informed decisions before, during, and following a disaster (Paton *et al.*, 2000). Improving readiness, Literacy can enhance the community's ability to respond effectively during catastrophes (Amini *et al.*, 2023; Ridgway, 2023; Muñoz *et al.*, 2022; Annaba *et al.*, 2020; Kamil *et al.*, 2020).

Behavioral Response - 9.4%

The focus on reactive knowledge includes rescue activities and emergency measures after a tragedy. The minor

segment indicates that response literacy may be insufficiently emphasized in the analyzed material. Although the proportion of reaction knowledge has diminished, it remains essential for the ability to respond swiftly during a disaster. This reaction skill is often associated with speed and effectiveness in responding to victims and environmental damage (Bullock *et al.*, 2017; Paton *et al.*, 2000).

Attitude: Prevention Awareness and Prevention Values - 11.3% and 7.5%

The two categories of attitudes, which include recognition of the importance of prevention and the values linked to education and social expenditures, represent a significant overall proportion. Awareness of prevention and values are elements of attitudes that foster proactive behavior in disaster management. Kagawa contends that integrating preventative principles into catastrophe education can foster a generation (Kagawa and Selby, 2015) that is more aware of risks and driven to implement mitigation strategies (Petal, 2008; Tsai *et al.*, 2020). This is crucial for character education, as pupils learn to evaluate the social and economic consequences of disasters.

Attitude: Sense of Responsibility - 11.3%

This sense of duty includes community preventive measures and evacuation planning, highlighting the importance of instilling social responsibility in disaster literacy education. Promoting a sense of accountability for prevention facilitates collaborative endeavors. This concept corresponds with social learning theory, which posits that individuals are driven to participate in preventive measures and actively aid others in catastrophes (Cerulli *et al.*, 2020)

Competencies: Preparedness Action and Behavioral Response - 9.4%

This skill category encompasses practical actions, such as identifying escape routes, engaging in exercises, and cooperating during evacuation operations. These competencies are essential in disaster literacy education since they directly relate to the ability to respond during a crisis. Paton et al. emphasize the need for drills and practical exercises to improve individual preparedness (Paton et al., 2000). Involving students in drills and simulations facilitates the acquisition of skills that could be life-saving in real crises.

The analytical findings reveal that the majority of disaster literacy focuses on Disaster Knowledge, which includes a basic understanding of disaster definitions, causes, human and environmental effects, and possible future threats. The substantial percentage in this category indicates that cognitive factors or foundational knowledge are considered crucial for fostering individual disaster preparedness. A thorough comprehension of catastrophes improves awareness and establishes a basis for communities to anticipate and devise disaster mitigation strategies more effectively (Saha *et al.*, 2022; Paton, Smith and Johnston, 2000).

In addition to a basic comprehension of disasters, knowledge of preparedness is a significant element of disaster literacy. This category includes understanding mitigation techniques and readiness measures, encompassing proactive actions that can be undertaken before a disaster, such as evacuation, asset protection, and emergency supplies. The focus on preparedness indicates that disaster literacy education aims to equip individuals with crucial knowledge for

swift and suitable responses in emergencies. This comprehension is essential for alleviating the impacts of disasters on communities (Makhutov *et al.*, 2020; Hamiel *et al.*, 2013).

The area of knowledge about response, despite its limited scope, is an essential component of disaster literacy. This competence includes rescue methods and emergency procedures to be executed during a disaster, encompassing rescue and evacuation techniques. Understanding post-disaster response is essential for equipping individuals and communities to react promptly and effectively during catastrophes, while also protecting themselves and others around them (Zhao, Su and Hu, 2022; Gin *et al.*, 2014).

Attitudes toward prevention are a vital component of disaster literacy, as awareness of the need of preventative actions motivates individuals to prioritize prevention in their daily lives. This mindset includes an awareness of risks and the importance of preventive measures to alleviate the negative impacts of disasters. In addition to awareness, the principles of prevention also hold considerable importance. Preventive values inform individuals that proactive activities significantly impact social and educational contexts, hence mitigating economic and social losses. (Stapleton and Meier, 2022; Honda et al., 2019).

Another attitude, namely a sense of duty in prevention, denotes an individual's desire to support disaster prevention efforts by promoting preventive measures in their community. This aspect of responsibility encourages engagement in disaster preparedness and mitigation training programs. Practical skills acquired through disaster literacy

education include preparatory strategies, such as recognizing escape routes and safe havens during a crisis, as well as behavioral competencies that promote collaboration during evacuation. These skills substantially improve an individual's readiness to react promptly and effectively in a crisis, hence potentially reducing risks and losses (Saha *et al.*, 2022; Paton, Smith and Johnston, 2000).

Comprehensive disaster literacy education includes the knowledge, attitudes, and skills essential for proficiently managing catastrophe risks. The significant degree of basic knowledge, preparedness, and preventative attitudes indicates an effort to improve cognitive understanding while also fostering essential attitudes and practical skills for managing disaster risks. The findings correspond with current literature that emphasizes the need to integrate these three factors to cultivate communities that are more prepared and resilient to future disasters (Prayogi, Ahzan and Rokhmat, 2022; P J Sampurno, Sari and Wijaya, 2015;).

B. Research Question Answer

RQ 1 – The Effectiveness of Edutainment Movies

Our analysis of edutainment resources reveals that online platforms like Coursera and Khan Academy provide scientifically robust films and articles that facilitate students' comprehensive grasp of disaster definitions and causes. Our content analysis indicates that the knowledge dimension constitutes the predominant share, 26.4 percent, signifying that edutainment videos are exceptionally effective in imparting core conceptual frameworks.

This emphasis on knowledge highlights the critical role of edutainment in fostering basic understanding, which is

necessary for developing more advanced skills and attitudes related to disaster preparedness.

Previous studies demonstrate that multimedia learning resources markedly enhance conceptual understanding and student engagement in disaster education (Loke *et al.*, 2021). Moreover, the accessibility and interactive nature of these digital materials foster ongoing student engagement and active learning, hence improving the recall and implementation of disaster literacy principles outside the classroom (Freitag *et al.*, 2020)

An review of short-form videos on the official BNPB and BMKG YouTube and TikTok channels indicates that these materials effectively foster a preventive mindset, despite their predominantly one-way character. The prevention-attitude factor constitutes over eleven percent of the total content, implicitly emphasizing the necessity of prioritizing disaster mitigation. In contrast, the component of practical skills—comprising evacuation protocols and readiness drills—constitutes merely 9.4 percent of the material, indicating substantial potential for enhancing content with actionable guidance. The integration of online platforms, documentary films, and social media illustrates that edutainment films significantly improve disaster literacy regarding knowledge and attitudes, while also underscoring the necessity for a stronger focus on practical skills to ensure thorough student preparedness.

RQ 2 – Key Characteristics of Edutainment Content

The level of scientific explication is the most salient aspect of edutainment content. Tables 2 and 3 indicate that most films, especially documentaries like *An Inconvenient Truth* and *Before the Flood*, present substantial scientific data

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concerning the causes, effects, and prospective dangers of disasters. The predominance of the knowledge dimension at 26.4 percent affirms that these materials successfully create a robust cognitive foundation for viewers. This discovery corresponds with optimal methodologies in educational video creation, which prioritize informative precision and analytical profundity to enhance audience comprehension (Martínez-Martínez et al., 2024).

Insights from online platforms (Table 1) and social media (Table 2) illustrate how interactive and visual methodologies expand reach and enhance user engagement. Dynamic infographics, succinct animations, and brief movies on Coursera, Khan Academy, and the official BNPB and BMKG channels facilitate quick access and maintain engagement among users with limited time. Nonetheless, despite these advantages in visual engagement, Table 3 reveals a notable deficiency in the practical skills domain—merely 9.4 percent of the content includes evacuation protocols or readiness exercise simulations. This discovery supports critiques that, although educational videos frequently excel in aesthetics, they inadequately offer the concrete guidance required for practical application.

RQ 3 – Optimal Integration into the Curriculum

A blended learning strategy can provide a solid foundation for developing a disaster literacy curriculum in higher education (Bajow et al., 2016). For instance, students may engage with high-quality documentary films, such as *Before the Flood*, or educational resources from BMKG as preliminary activities, thereafter participating in interactive modules on online platforms like Coursera

that include preparedness simulations. This combination offers a comprehensive scientific theoretical basis while promoting active participation through quizzes, animations, and virtual case studies. Consequently, essential concepts regarding disaster definitions, causes, and hazards become clearer and more accessible at all times.

Moreover, integrating a specialized component into an existing disaster mitigation course helps enhance the application of information to practical scenarios. During a single session, the instructor may direct students to evaluate portions of edutainment films to elucidate the merits and shortcomings of their instructional content, subsequently advancing to a straightforward field simulation, such as a campus evacuation drill or a structured emergency response exercise. Collaboration with governmental agencies such as BMKG and BNPB is vital to ensure material accuracy and relevance. Students can engage in combined workshops with practitioners to receive hands-on training, validate preparedness methods, and acquire practical feedback, thereby enhancing the curriculum's empirical relevance to Indonesia's disaster challenges.

CONCLUSION

This study concludes that the analyzed documentary films and videos have considerable potential to improve disaster literacy, especially regarding knowledge and attitudes. Nonetheless, the skill aspect remains undervalued in mainstream cinema. Instructional films from organizations such as BMKG and BNPB are more effective in conveying specific strategies related to disaster mitigation and response. Therefore,

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further films and videos ought to prioritize realism and education, while also fostering greater community involvement in preparedness training. Effective disaster education must incorporate multiple aspects and approaches, including both formal and non-formal education, while including the entire community. This comprehensive approach will improve overall disaster literacy and better prepare the community to face emergencies.

SUGGESTION

This study offers several recommendations. Initially, curriculum developers and university instructors should establish precise learning objectives that include knowledge, attitudes, and skills. Subsequently, appropriate documentary films and online modules must be chosen based on their scientific validity and accessibility. Clips from *Before the Flood* serve to illustrate extreme climate scenarios, whereas interactive modules from Coursera can be utilized for early response simulations.

In the absence of practical details in a video, instructors may enhance the learning experience by incorporating local case studies or facilitating hands-on exercises on campus. Students may be instructed to delineate evacuation routes from lecture halls to the nearest assembly points or engage in concise simulations based on scenarios approved by BNPB or local BPBD authorities. Collaboration with practitioners from BNPB and BMKG will enhance the material and ensure that the protocols learned are consistent with official standards.

Third, curriculum teams may create succinct reference materials, including infographics or preparedness checklists, that encapsulate mitigation

steps in a format that is easily retained. Edutainment transforms passive viewing into a catalyst for contextualized learning, actively engaging students in disaster response practice. Integrating theory, motivation, and practical action will enhance disaster literacy education in higher education, resulting in a more comprehensive approach and improved readiness for real-world application.

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REFERENCES

- Abu-Alsaad, HA, & Al-Taie, RRK 2021, 'Virtual reality in production layout designing', *Applied Computer Science*, no. 17, pp. 61–68. doi:10.23743/acs-2021-06
- Afriani, R, Islami, ZR 2019, 'Peningkatan potensi mitigasi bencana dengan penguatan kemampuan literasi kebencanaan pada masyarakat Kota Langsa', *J Pendidik.Geogr*, vol. 24, no. 2, pp. 132–144. doi:10.17977/um017v24i22019p13
- Alexander, D 2013, 'Approaches to emergency management teaching at the master's level', *J Emerg Manag*, no. 11, pp. 59–72. doi:10.5055/jem.2013.0128
- Amini, FF, Hidarnia, AA, Ghofranipour, FF, Motlagh, ME, RahPima, & AM, Shampour, N 2023, 'Determinants of health volunteer training in natural hazard management in Iran', *Jamba J Disaster Risk Stud*, no. 15. doi:10.4102/JAMBA.V15I1.1384
- Annaba, P, Utaya, S, & Hari, D 2020, 'Improving disaster knowledge within high school students through geographic literacy', *Int J Disaster Risk Reduct*, vol. 43, 101411. doi:10.1016/j.ijdr.2019.101411
- Arai, T, Ishihara, T, Watanabe, Y, Takeda, S, Fukamizu, Y, Ishida, T, Iijima, H,

- Inaba, M, Konishi, E, Kaneko, T, Yoshida, J, Kitagawa, T, Nasukawa, A, Nada, T, Takahashi, H, Oyama, H, Koike, T, Murata, S, Ebata, & K, Kaneko, J 2023, 'Development and educational effectiveness of an e-learning training system for radiation disaster management', *Japanese J Heal Phys*, vol. 58, pp. 203-208. doi:10.5453/jhps.58.203
- Baggaley, J 2020, 'Educational distancing', *Distance Educ*, vol. 41, pp. 582-588. doi:10.1080/01587919.2020.1821609
- Bajow, N, Djalali, A, Ingrassia, PL, Ragazzoni, L, Ageely, H, Bani, I, Corte, FD 2016, 'Evaluation of a new community-based curriculum in disaster medicine for undergraduates', *BMC Med Educ*, vol. 16(1):225. doi:10.1186/s12909-016-0746-6
- Banerjee, D, & Sathyanarayana Rao, T 2020, 'Psychology of misinformation and the media: Insights from the COVID-19 pandemic', *Indian J Soc Psychiatry*, vol. 36, pp. 131-137. doi:10.4103/ijsp.ijsp_112_20
- Basch, CH., Basch, CE, Hillyer, GC, & Meleo-Erwin, ZC 2022, 'Social Media, Public Health, and Community Mitigation of COVID-19: Challenges, Risks, and Benefits', *J. Med. Internet Res*, vol. 24. doi:10.2196/36804
- Brown, LM, Haun, JN, & Peterson, L 2014, 'A Proposed disaster literacy model', *Disaster Med. Public Health Prep*, vol. 8, pp. 267-275. doi:10.1017/dmp.2014.43
- Bullock, J, Haddow, G, & Coppola, D 2017, 'Introduction to emergency management', Butterworth-Heinemann, United States
- Burch, S, & Robinson, J 2015, 'A framework for explaining the links between capacity and action in response to global climate change, in: Integrating Climate Change Actions into Local Development', Routledge, pp. 304-316. doi:10.1080/14693062.2007.9685658
- Canbolat, MA 2023, 'Impact of digital literacy on cyberloafing and compulsive social media use post-kahramanmaraş earthquake', *Proceedings of the European Conference on E-Learning, ECEL*, pp. 33-38.
- Cerulli, D, Scott, M, Aunap, R, Kull, A, Pärn, J, Holbrook, J, & Mander, Ü 2020, 'The role of education in increasing awareness and reducing impact of natural hazards', *Sustain*, vol. 12. doi:10.3390/su12187623
- Chen, Y, Li, J, & Chen, A 2021, "Does high risk mean high loss: Evidence from flood disaster in southern China", *Sci Total Environ*, vol. 785, 147127. doi:10.1016/j.scitotenv.2021.147127
- Chung, SC & Yen, C 2016, 'Disaster prevention literacy among school administrators and teachers: a study on the plan for disaster prevention and campus network deployment and experiment in Taiwan', *J. Life Sci*, 10, 203-214. https://doi.org/10.17265/1934-7391/2016.04.006
- Comfort, LK, Kapucu, N, Ko, K, Menoni, S, & Siciliano, M 2020, 'Crisis decision-making on a global scale: transition from cognition to collective action under threat of COVID-19', *Public Adm. Rev*, vol. 80, pp. 616-622. doi:10.1111/puar.13252
- Dai, B, Fu, D, Meng, G, Liu, B, Li, Q, & Liu, X, 2020, 'The effects of governmental and individual predictors on COVID-19 protective behaviors in China: A path analysis model', *Public Adm Rev*, vol. 80 no. 5, pp. 797-804. doi:10.1111/puar.13236
- Djalante, R, 2018, 'Review article: A systematic literature review of research trends and authorships on natural hazards, disasters, risk reduction and climate change in Indonesia', *Nat. Hazards Earth Syst Sci*, vol.18, pp. 1785-1810. doi:10.5194/nhess-18-1785-2018
- Dores, APDA 2021, 'Questioning the hope in science and schooling', *Crit Sociol*, vol. 47, pp. 687-698. doi:10.1177/0896920520973728
- Duan, T, Jiang, H, Deng, X, Zhang, Q, & Wang, F 2020, 'Government intervention, risk perception, and the adoption of protective action recommendations: Evidence from the COVID-19 prevention and control experience of China', *Int. J Environ Res Public Health*, vol. 17, pp. 3387. doi: 10.3390/ijerph17103387

- Foster, M, Brice, JH, Shofer, F, Principe, S, Dewalt, D, Falk, R, & Ferris, M 2011, 'Personal disaster preparedness of dialysis patients in North Carolina', *Clin J Am. Soc Nephrol*, vol 6, pp. 2478–2484. doi:10.2215/CJN.03590411
- Freitag, B, Hicks, T, Jerolleman, A, & Walsh, W 2020. 'Storytelling-Plots of resilience, learning, and discovery in emergency management', *J Emerg Manag*, vol. 18, pp. 363–371. doi:10.5055/jem.2020.0485
- Gin, JL, Stein, JA, Heslin, KC, & Dobalian, A 2014, 'Responding to risk: Awareness and action after the September 11, 2001 terrorist attacks', *Saf. Sci.* 65, 86–92. <https://doi.org/10.1016/j.ssci.2014.01.001>
- Goldgruber, E, Sackl-Sharif, S, Ausserhofer, J, & Gutounig, R 2018, 'When the levee breaks: Recommendations for social media use during environmental disasters', *Social Media Use in Crisis and Risk Communication*, Emerald Publishing Limited, Leeds. pp. 229–253. doi:10.1108/978-1-78756-269-120181015
- Hamiel, D, Wolmer, L, Spirman, S, & Laor, N 2013, 'Comprehensive child-oriented preventive resilience program in Israel based on lessons learned from communities exposed to war, terrorism and disaster', *Child Youth Care Forum* vol. 42, pp 261–274. doi:10.1007/s10566-013-9200-7
- Hansson, S, Orru, K, Siibak, A, Bäck, A, Krüger, M, Gabel, F, & Morsut, C 2020, 'Communication-related vulnerability to disasters: A heuristic framework', *Int J Disaster Risk Reduct*, vol. 51, pp. 101931. doi:10.1016/j.ijdr.2020.101931
- Haristiani, N, Septiana, A, Nor, NFM, & Ryota, N 2023, 'The politeness of criticism speech acts in Japanese and Minangkabau films', *Indones J Appl Linguist*, vol. 13, no. 1, pp. 131-148. doi:10.17509/ijal.v13i1.58272
- Hay, P, & Hay, R 2014, 'Teaching through play: New game educates rural communities on risk', *Water Wheel*, vol. 13, pp. 26–29. ISBN: 978-87-999589-6-2
- Honda, Y, Fujiwara, T, Yagi, J, Homma, H, Mashiko, H, Nagao, K, Okuyama, M, Ono-Kihara, M, & Kihara, M 2019, 'Long-term impact of parental post-traumatic stress disorder symptoms on mental health of their offspring after the great East Japan earthquake', *Front Psychiatry*, vol. 10. doi:10.3389/fpsy.2019.00496
- Huang, L, Yao, Q, Gu, X, Wang, Q, Ren, L, Wang, Y, Hu, P, Guo, L, Liu, M, & Xu, J 2021, '1-year outcomes in hospital survivors with COVID-19: a longitudinal cohort study', *Lancet*, vol. 398, pp. 747–758. doi:10.1016/S0140-6736(21)01755-4
- Kagawa, F, & Selby, D 2015, 'Disaster risk reduction in the school curriculum: the present and potential role of development agencies and the implications for the Hyogo Framework for Action 2005-2015 successor', Unpubl Rep Comm, by PLAN Int
- Kamil, PA, Utaya, S, Sumarmi, & Utomo, DH 2020, 'Improving disaster knowledge within high school students through geographic literacy', *Int J Disaster Risk Reduct*, vol. 43, pp. 101411. doi:10.1016/j.ijdr.2019.101411
- Kitagawa, K 2021, 'Conceptualising 'disaster education'. *Education Sciences*, vol. 11, no.5, pp. 233. doi:10.3390/educsci11050233
- Klobas, JE, McGill, TJ, Moghavvemi, S, & Paramanathan, T 2018, 'Compulsive YouTube usage: A comparison of use motivation and personality effects', *Comput. Human Behav*, vol. 87, pp. 129–139. doi:10.1016/j.chb.2018.05.038
- Lathifa, E, & Putra, RD 2022, 'Tingkat literasi kebencanaan mahasiswa asal Indonesia yang sedang studi di Izmir, Turki', *J Ilm Komun, STIKOM IMA*, vol. 14, pp. 131–140. doi:10.33221/jikom1.v14i03.236
- Leaver, T, Highfield, T, & Abidin, C 2020, 'Instagram: Visual social media cultures', John Wiley & Sons.
- Lichao, W, Desa, MAM, 2024, The effectiveness of innovative teaching approaches on the family instructions of zhuzi through animation in primary school: a case study of attitudes of cultural educators and cultural experts in Fujian, China', *Educ Adm Theory Pract*, vol. 30, pp. 1156–1166.

doi:10.53555/kuey.v30i6.5460

- Lindell, MK, & Perry, RW 2012, 'The protective action decision model: theoretical modifications and additional evidence', *Risk Anal*, vol. 32, pp. 616–632. doi:10.1111/j.1539-6924.2011.01647.x
- Loke, AY, Guo, C, & Molassiotis, A 2021, 'Development of disaster nursing education and training programs in the past 20 years (2000–2019): A systematic review', *Nurse Educ Today*, vol. 99. doi:10.1016/j.nedt.2021.104809
- Lopezosa, C, Orduña-Malea, E, & Pérez-Montoro, M 2020, 'Making video news visible: Identifying the optimization strategies of the cybermedia on YouTube using web metrics', *Journal Pract*, vol. 14, pp. 465–482. doi:10.1080/17512786.2019.1628657
- Makhutov, NA, Gadenin, MM, Buynovskiy, SN, & Grazhdankin, AI 2020, 'Scientific fundamentals of industrial safety in the multivolume series safety of russia. Legal, socio-economic and scientific-technical aspects', *Bezop Tr v Promyshlennosti*, pp. 17–26. doi:10.24000/0409-2961-2020-4-17-26
- Marlyono, SG 2016, 'Peranan literasi informasi bencana terhadap kesiapsiagaan bencana masyarakat Jawa Barat', *J Geogr Gea*, vol. 16, pp. 116–123. doi:10.17509/gea.v16i2.4491.g9968
- Marlyono, SG, & Siliwangi, U 2019, 'Students' Tsunami Preparedness Level Comparison in Pangandaran Indonesia', *J Pendidik Ilmu Sos*, vol. 28, no. 2, pp. 164–171. doi:10.17509/jpis.v28i2.21019
- Martínez-Martínez, A, Montoliu, R, & Remolar, I 2024, 'Which videos are better for the students? Analyzing the student behavior and video metadata', *Heliyon*, vol. 10, pp. e39682. doi:10.1016/j.heliyon.2024.e39682
- Maziriri, ET, Gapa, P, & Chuchu, T 2020, 'Student perceptions towards the use of YouTube as an educational tool for learning and tutorials', *Int J Instr*, vol. 13, no. 2, pp. 119–138. doi:10.29333/iji.2020.1329a
- McCrow-Young, A 2021, 'Approaching Jurnal Penelitian dan Pembelajaran IPA Vol. 11, No. 1, 2025, p. 39-59
- Instagram data: reflections on accessing, archiving and anonymising visual social media', *Commun Res Pract*, vol. 7, pp. 21–34. doi:10.1080/22041451.2020.1847820
- Mikami, T, Shibayama, T, Esteban, M, Ohira, K, Sasaki, J, Suzuki, T, Achiari, H, & Widodo, T 2014, 'Tsunami vulnerability evaluation in the Mentawai islands based on the field survey of the 2010 tsunami', *Nat Hazards*, vol. 71, pp. 851–870. doi:10.1007/s11069-013-0936-z
- Minanto, A, & Ningsih, INDK 2018, 'Literasi bencana di sekolah gunung merapi tentang mitigasi bencana dan kewarganegaraan transformatif', *Wacana J Ilm. Ilmu Komun*, vol. 17, pp. 207–216
- Mitchell, T, Haynes, K, Hall, N, Choong, W, & Oven, K 2008, 'The roles of children and youth in communicating disaster risk', *Child Youth Environ*, vol. 18, pp. 254–279
- Moghavvemi, S, Lee, ST, & Lee, SP 2018a, 'Perceived overall service quality and customer satisfaction: A comparative analysis between local and foreign banks in Malaysia', *Int J bank Mark*, vol. 36, pp. 908–930.
- Moghavvemi, S, Sulaiman, A, Jaafar, NI, Kasem, N 2018b, 'Social media as a complementary learning tool for teaching and learning: The case of youtube', *Int. J. Manag. Educ*, vol. 16, pp. 37–42.
- Muñoz, JA, Segura, CM, Esquivel, CC, & Castillo, GB 2022, 'Disaster risk management: competencies for a new hydro-environmental culture', *Uniciencia*, vol. 36, doi:10.15359/ru.36-1.8
- Nakano, G, Yamori, K, Miyashita, T, Urta, L, Mas, E, & Koshimura, S 2020, 'Combination of school evacuation drill with tsunami inundation simulation: Consensus-making between disaster experts and citizens on an evacuation strategy', *Int J Disaster Risk Reduct*, vol. 51. doi:10.1016/j.ijdr.2020.101803
- Nuraziz, S, Maryani, E, & Yani, A 2023, 'The effect disaster literacy on students preparedness mitigating tsunami in coastal area Pangandaran', *J Geogr, Gea*, vol. 23, pp. 60–66. doi:10.17509/gea.v23i1.56388
- Prasetyaningsih, et al

- Nurjanah, S, & Mursalin, E 2021, 'The importance of landslide natural disaster mitigation: Study of student perceptions', *J. Basicedu*, vol. 6, pp. 515–523.
- Nyirahabimana, P, Minani, E, Nduwingoma, M, & Kemeza, I 2023, 'Multimedia-aided technologies for effective learning of quantum physics at the university level', *J Sci Educ Technol*, vol. 32, pp. 686–696. doi:10.12688/fl000research.128013.1
- Okocha, DO, Agbele, DJ, & Josiah, S 2023, 'Social media for disaster awareness and management in Nigeria', vol. 15, no. 1, pp. 1-14
- Park, W 2020, 'Beyond the 'two cultures' in the teaching of disaster: or how disaster education and science education could benefit each other', *Educ Philos Theory*, vol. 52, pp. 1434–1448. doi:10.1080/00131857.2020.1751126
- Paton, D, Smith, L, Johnston, DM 2000, 'Volcanic hazards: risk perception and preparedness', *New Zealand Journal of Psychology*, Vol. 29, No. 2, pp. 86-91
- Petal, M 2008, 'Disaster prevention for schools guidance for education sector decision-makers consultation version', November 2008, Consult Version, UNISDR, Geneva
- Prakoso, B, Widana, IDKK, & Subiyanto, A 2021, 'Pendidikan dan literasi bencana dalam kerangka tri sentra pendidikan untuk generasi tangguh bencana', *J Manaj Bencana*, vol. 7, no. 1
- Prasetyaningsih, Liliarsari, Ramalis, TR, & Riza, LS 2024, 'Developing science edutainment for prospective science teachers', *KnE Soc Sci*, vol. 9, pp. 737-747. doi:10.18502/kss.v9i13.15992
- Prasetyaningsih, Kaniawati, I, Riza, LS, & Utama, JA 2025, 'Evaluating research trends and gaps in disaster literacy within science education: a bibliometric perspective. evaluation in education', *JEE*, Vo. 6, No. 1, pp. 138-149. doi: 10.37251/jee.v6i1.1248
- Prayogi, S, Ahzan, S, & Rokhmat, J 2022, 'Opportunities to stimulate the critical thinking performance of preservice science teachers through the ethno-inquiry model in an e-learning platform', *Int J Learn Teach Educ Res*, vol. 21, pp. 134–153. doi:10.26803/ijlter.21.9.8
- Rahmani, H, Wafa, W, & Mazloun Yar, FG 2021, 'The importance of public awareness in environmental protection: a case study in Paktika, Afghanistan', *Nat Environ Pollut Technol*, vol. 20, pp. 1621–1626. doi:10.46488/NEPT.2021.v20i04.024
- Ridgway, J 2023, 'Statistics for empowerment and social engagement: teaching civic statistics to develop informed citizens, statistics for empowerment and social engagement: teaching civic statistics to develop informed citizens', Springer, doi:10.1007/978-3-031-20748-8
- Saha, S, Tapuke, S, Kennedy, B, Tolbert, S, Tapuke, K, Macfarlane, A, Hersey, S, Leonard, G, Tupe, R, Ngaropo, P, Milroy, K, & Smith, B 2022, 'A place-based virtual field trip resource that reflects understandings from multiple knowledge systems for volcano hazard education in Aotearoa NZ: Lessons from collaborations between Māori and non-Māori', *J Geosci Educ*, doi:10.1080/10899995.2022.2109397
- Sampurno, Pandu J., Sari, Y.A., Wijaya, A.D., 2015. Integrating STEM (Science, Technology, Engineering, Mathematics) and Disaster (STEM-D) Education for Building Students' Disaster Literacy, *Int J Learn*, vol. 1, pp. 73–76. doi:10.18178/IJLT.1.1.73-76
- Sampurno, P J, Sari, YA, Wijaya, AD 2015, 'Integrating STEM (Science, Technology, Engineering, Mathematics) and Disaster (STEM-D) Education for Building Students' Disaster Literacy', *Int J Learn*, vol 1, pp. 73–76. doi:10.18178/IJLT.1.1.73-76
- Septiyani, RD, Juhadi, J, Setyowati, DL, & Aji, A 2024, 'Peran forum pengurangan risiko bencana (fprb) dalam literasi bencana erupsi merapi di Kecamatan Dukun Kabupaten Magelang', *Geogr J. Kajian Penelit dan Pengemb Pendidik*, vol. 12, pp. 531–544. doi:10.31764/geography.v12i1.21000
- Settembre-Blundo, D, González-Sánchez, R, Medina-Salgado, S, & García-Muiña, FE 2021, 'Flexibility and
- Prasetyaningsih, et al
- Jurnal Penelitian dan Pembelajaran IPA
Vol. 11, No. 1, 2025, p. 39-59

- resilience in corporate decision making: a new sustainability-based risk management system in uncertain times', *Glob J Flex, Syst Manag*, vol. 22, pp. 107–132. doi:10.1007/s40171-021-00277-7
- Ssennoga, M, Kisira, Y, Mugagga, F, Nadhomi, D 2022, 'Resilience of persons with disabilities to climate induced landslide hazards in the vulnerable areas of Mount Elgon, Uganda', *Int J Disaster Risk Reduct*, vol. 80. doi:10.1016/j.ijdr.2022.103212
- Stapleton, SR, Meier, BK 2022, 'Science education for and as resiliency through indoor agriculture', *J Res Sci Teach*, vol. 59, pp. 169–194. doi:10.1002/tea.21724
- Stewart, AE, Knox, JA, & Schneider, P 2015, "Piloting and evaluating a workshop to teach Georgia teachers about weather science and safety", *J Geosci Educ*, vol. 63, pp. 271–284. doi:10.5408/14-069.1
- Stone, NJ, Yan, G, Nah, FFH, Sabharwal, C, Angle, K, Hatch, ., Runnels, S, Brown, V, Schoor, G, & Engelbrecht, C 2021, 'Virtual reality for hazard mitigation and community resilience: an interdisciplinary collaboration with community engagement to enhance risk awareness', *AIS Trans Human-Computer Interact*, vol. 13, pp. 130–144. doi:10.17705/1thci.00145
- Suka, M, Yamauchi, T, & Yanagisawa, H 2021, 'Changes in health status, workload, and lifestyle after starting the COVID-19 pandemic: a web-based survey of Japanese men and women', *Environ Health Prev Med*, vol. 26, pp. 1–11. doi:10.1186/s12199-021-00957-x
- Tarnoto, N, Yuniawati, R, & Wijayati, RD 2023, 'Social media use and various factors affecting Indonesian mental health during the COVID-19: a pathway to remember', *Int J Public Heal Sci*, vol. 12, pp. 1694–1700. doi:10.11591/ijphs.v12i4.22390
- Tsai, MH, Chang, YL, Shiau, JS, & Wang, SM 2020, 'Exploring the effects of a serious game-based learning package for disaster prevention education: The case of battle of flooding protection' *Int J disaster risk Reduct*, vol. 43, pp. 101393. doi:10.1016/j.ijdr.2019.101393
- Van Kerkhoff, L, & Pilbeam, V 2017, 'Understanding socio-cultural dimensions of environmental decision-making: A knowledge governance approach', *Environ, Sci Policy*, vol. 73, pp. 29–37. doi:10.1016/j.envsci.2017.03.011
- Vidergor, HE, & Ben-Amram, P 2020, 'Khan academy effectiveness: The case of math secondary students' perceptions', *Computers & Education*, vol. 157, pp. 103985, doi:10.1016/j.compedu.2020.103985
- Vu, BD, Nguyen, HT, Dinh, HVT, Nguyen, QAN, & Ha, X Van 2023, 'Natural disaster prevention literacy education among Vietnamese high school student', *Educ Sci*, vol. 13, pp. 262. doi:10.3390/educsci13030262
- Wamsler, C, Brossmann, J, Hendersson, H, Kristjansdottir, R, McDonald, C, & Scarampi, P 2018, 'Mindfulness in sustainability science, practice, and teaching', *Sustain Sci*, vol. 13, pp. 143–162. doi:10.1007/s11625-017-0428-2
- Zhao, T, Su, Q, & Hu, X 2022, The relationships between family characteristics and undergraduate students' covid-19 responses: a cross-sectional study in China', *Front Public Heal*, vol. 10: 873696. doi:10.3389/fpubh.2022.873696