Communication and Disaster Education in The Perspective of Learning Theory: A Literature Review

Wa Ode Sitti Nurhaliza[1*], Wichitra Yasya[2], Qurota Ayuningtyas[3]
[1]Faculty of Communication, Bhayangkara University, Jakarta Raya, Indonesia, wa.ode@dsn.ubharajaya.ac.id
[2]Faculty of Communication, Bhayangkara University, Jakarta Raya, Indonesia, wichitra.yasya@dsn.ubharajaya.ac.id
[3]Faculty of Communication, Bhayangkara University, Jakarta Raya, Indonesia

Corresponding Author: wa.ode@dsn.ubharajaya.ac.id[1]

Abstract: Indonesia is known as a supermarket disaster country. Responding to various disasters that have occurred, and even potential disasters, has prompted various parties to take concrete steps as disaster mitigation efforts. Communication plays a crucial role in disaster information flow. Communicators, in this case, the National Disaster Management Agency (BNPB) and authorized parties, are key to the smooth dissemination of disaster messages/information. However, the community, as the affected party in disasters, also needs to be provided with clear information on how to deal with disaster situations. This article aims to identify and explain the application of learning theories in the context of disaster communication, describe the development of disaster communication research in Indonesia, and discuss the implementation of disaster education concepts in various countries. The method used is a literature review from related ebooks and journals. The results obtained are as follows: First, communication and disaster education are interrelated in order to enhance disaster literacy across all regions. Second, communication plays a primary role in disaster education programs from the government's policy-making perspective, institutions observing disaster issues, and the community (disaster victims). Effective, efficient, and targeted information flow is crucial both in pre-disaster, during a disaster, and post-disaster phases. Third, there is a need to integrate disaster education into the curriculum, both at the school and university levels. This ensures that each individual knows and understands what to do when a disaster occurs, how we perceive disasters, and so on. Additionally, various theoretical approaches can be used to study disaster communication in an educational context, including: Behavioral learning, which focuses on observable behaviors, Cognitive Learning, which views learning as a mental process, Affective learning, which is related to emotions and affection and plays a role in learning, and Social learning, which views disaster learning as a social process where knowledge is collectively built within a specific social environment.

Keywords: Communication, Disaster, Community, Education

INTRODUCTION

Indonesia as an island country is located between two oceans (Indian-Pacific). The National Disaster Management Agency (BNPB) explains that geographically Indonesia is an archipelago country which is located at the junction of four tectonic plates, namely the Asian continental plate, the Australian continental plate, the Indian Ocean plate and the Pacific Ocean plate (Lilik Tahmidaten 2019). As stated by the Chairman of the Meteorology, Climatology and Geophysics Agency (BMKG) Andi Eka Sakya, there are so many potential disasters that Indonesia is called a "disaster supermarket" country.(Indonesia is a disaster "supermarket" country _ Merdeka 2015). A study conducted by Bündnis Entwicklung Hilft and Ruhr University Bochum, Germany, published in Word Risk Repost 2018, explains that Indonesia is ranked 39th in the world in terms of disaster risk and is classified as High Risk.(Hilft. 2018). This is reinforced by data from BNPP showing that the total number of disasters in Indonesia in 2022 will reach 462 disasters consisting of earthquakes, volcanic eruptions, forest and land fires, floods, landslides and so on. (Badan Nasional Penanggulangan Bencana 2022).

We have learned a lot from the disasters that occurred in Indonesia. The 2004 tsunami that drowned Aceh had 226,308 people who died/disappeared, 1,849,827 people were displaced(Syamsidik 2019). Then there was the earthquake in Jogjakarta in 2006 which also left hundreds of people homeless. Several years ago (2019) the North Sulawesi region was hit by a tsunami and earthquake (Geologi 2019). Not to mention that major flooding in the Jabodatabek area occurred at the start of the new year 2020, resulting in hundreds of residents having to evacuate for days and suffering losses of up to hundreds of millions. Information about tsunamis, earthquakes and other natural disasters quickly spreads through social media. Both through statuses uploaded by the public and the media that covers and broadcasts it.

Responding to various disasters that have occurred and even potential disasters that will occur has encouraged various parties to take concrete steps as an effort to overcome disasters. Referring to Law of the Republic of Indonesia Number 24 of 2007 concerning Disaster Management Article 21 states that BNPBD (Regional Disaster Management Agency) has the task of disaster management efforts including disaster prevention, disaster management, rehabilitation and reconstruction in a fair and equitable manner.(2007 nd). In this case, BNPB as the authority must carry out intensive coordination and communication channels with parties involved in disaster management.

Communication is an important aspect in the traffic of disaster information. Communicators, in this case BNPB and a set of authorities, are the main key in the smooth flow of disaster messages/information. Nevertheless, the community as the party affected by the disaster, in this case communication, must also be given clear information about how to deal with disaster situations. How to prepare a disaster resilient community is one of the important aspects in preparing for disasters that will occur in the future(Ulum 2014). Communication approach, education in disasters can be a new offer in forming a disaster resilient society. To create a disaster-resilient society, the burden is not only on one party, in this case the government, but there needs to be good integration between the government, related NGOs, and the community itself as disaster victims. So it is important to provide disaster education programs to the public, from urban to rural communities, especially disaster-prone areas.

The disaster education approach can be applied at various levels of society. Even including it in the school education curriculum is a concrete step in providing disaster education to the community. The expected output of disaster education is that students (children) have disaster literacy(Sung-Chin Chung 2016).

This article will discuss how disaster education is implemented in various countries where communication is considered an important aspect in providing disaster education in educational institutions and in the community. The explanation in this paper will begin by explaining disasters from various perspectives, disaster communication, the relationship between disaster communication and other fields of science. Apart from that, this article will describe theories that can be used in disaster education and communication as well as the figures who developed these theories. At the end, a literature study will be described regarding the implementation of disaster education in various countries. In this case, communication is an important aspect in delivering disaster education.

Based on the background description, this article will describe 3 (three) things, namely (1) How are learning theories applied in the context of disaster communication?, (2) How is the development of disaster communication research in Indonesia?, and (3) How is the disaster education implemented in

various countries?. This article aims to identify and explain the application of learning theories in the context of disaster communication, to explain the development of disaster communication research in Indonesia and to explain the implementation of disaster education concepts in various countries.

Disaster communication has become an interesting study in recent years. This is because for a decade Indonesia was hit by various disasters which prompted various parties to carry out further studies regarding the disasters themselves. Communication is an important aspect in disaster assessment from pre-disaster, when a disaster occurs to post-disaster. Communication occupies the main space in the discussion of disaster studies itself. Various programs carried out by the government include outreach, forming disaster volunteers from central to regional levels, starting a disaster education approach in schools where all these activities involve communication transactions. Furthermore, the author will explain theoretically related to disaster communication and how disaster education is implemented in various countries, including Indonesia.

METHOD

This article employed the literature study method. The author collected various information related to disaster communication from books, ebooks, and research articles. Books and ebooks are used by authors to theoretically explain disaster communication, the scope and theories that can be used to analyze disaster communication. Meanwhile, research articles are used to obtain information related to research developments in the field of disaster communication studies.

RESULT AND DISCUSSION

Application of Learning Theories in the Context of Disaster Communication

Neil Dufty (2020) in his book Disaster Education, Communication and Engagement discusses disaster education which is currently gaining popularity in various countries. Several countries use a disaster education approach to prepare disaster resilient communities. People need to take care of themselves and those around them during and after a disaster. So disasters are seen as social constructions. This means that there is a group/society/community involved in it. Talking about disasters cannot be separated from the people/individuals involved in it, whether the community as the party affected by the disaster, the government as the stakeholder, and so on.

Communication is the act of transferring information from one place to another. This can indicate two different processes namely information transmission (one-way process) and information sharing (mutual process). In disaster management, the transmission model (one-way process) is mainly used where there is information disseminated by emergency agencies for warning. In contrast, the idea of information sharing implies an equal or mutually beneficial process(Dufti 2020).

Furthermore, (Dufti 2020)argue that disaster education and engagement are both necessary because they provide 'breadth' and 'depth' to disaster learning. This requires an understanding of disasters that is not only borne by stakeholders but all aspects and levels of society must be well educated. The government as a stakeholder can involve organizations to formulate effective disaster education strategies so that people, both children and adults, have good disaster literacy.

There is still little learning theory in the context of disaster education, even though this is the basis for designing disaster education messages. Learning Theory can be grouped into four perspectives, namely behavioral (focuses on observable behavior), cognitive (learning as a mental process), affective (emotions and affection play a role in learning) and social (humans learn best in group activities).(Dufti 2020).

a. *Behavioral Learning*

In disaster communication, appropriate behavior before, during and after an emergency is necessary for disaster learning to remember its objectives. Behaviorism has an appeal in disaster learning which aims to shape safe behavior. Behaviorism in learning theory focuses on objective and observable behavioral components. Almost all behaviorist theories discuss stimulus-response for learning. Just like the experiments carried out by Pavlov (Herliani, Didisminus Tanah Boleng 2008). Behavioral learning in the context of disasters can be used to look at the disaster preparedness training process, where behavior when responding to disasters or evacuating disaster victims has been studied previously.

b. *Cognitive Learning*

The cognitive learning approach places learning as a mental process. This is related to information processing theory and Gestalt theory which tries to explain how people learn through perception, decision making, attention, memory and problem solving. In cognitive learning studies, Piaget's cognitive development theory is used to look at education, communication and disasters. This focuses more on how individual age, especially children, changes in individual understanding of forest fire risk and mitigation.

Many models of disaster psychology (e.g. Paton 2006; Grothmann and Reusswig 2006) identify a variety of cognitive processes that relate well to cognitive learning theory. Information processing is critical for people taking appropriate action regarding warning messages. Perception, decision making, attention, memory, and problem solving are cognitive processes identified by disaster psychologists as important for preparedness, response, and resilience. Disaster education activities derived from cognitive theory can include problem-solving preparedness, sending and receiving disaster information (for example using social media), learning decision making through scenarios, and providing information to increase risk awareness and perception. In addition, the constructivist approach is relevant to disaster learning where people alone, or together in organizations and communities, construct meaning of disasters from the information they receive (e.g. warnings) and their previous experiences.(Dufti 2020).

c. *Affective Learning*

There are three affective learning approaches that are relevant to disaster learning. Experiential Learning was pioneered by Carl Rogers whose emphasis was on cognitivism in education. He assumes that the highest level of learning isSignificant includes personal involvement at the affective and cognitive level starting from oneself which is then internalized and changes attitudes and behavior. The experiential learning activity recommended in disaster education is playing emergency simulation games.

Furthermore, *Social and emotional learning*(SEL)/social and emotional learning is a process of learning life skills including how to deal with oneself and others effectively. In the SEL field, when facing oneself, SEL will help in recognizing emotions and learning how to manage these feelings. Finally, the relevant affective theory is transformational learning which applies in adult education. This theory induces broader changes in learning and produces significant impacts in the learning experience. Transformational learning for disaster resilience can include role-playing, disaster case studies, thought exploration, and critical reflection on disasters around the world.

d. *Social Learning*

Learning with the community is considered quite effective in increasing group understanding. Social learning requires social capital in a community. There are two social learning theories that are potentially relevant to disaster education, namely: '*situated learning' and 'communities of practice'*. situated learning' was first put forward by Jean Lave and Eitene Wenger as a model of learning in communities. In short, situated learning is learning that occurs in the same context in which it is applied. Learning is not seen as an abstract and unconceptualized transfer of knowledge from one individual to another, but as a social process in which knowledge is built together in a particular social environment.

The social learning model specifically requires a social capital approach, cooperation and joint learning before, during and after a disaster. This can also be supported by social media as a means of cooperative learning regarding disaster issues. Social media makes it easier to interact with other people without geographic and time restrictions. Forms of collective (community) learning activities with disaster education include social media, post-disaster meetings and forums, disaster mitigation planning workshops, field visits(Dufti 2020).

The following describes the identification of learning processes that occur in all ages and sectors of society from the perspective of learning theories:

Table 1 Summary of relevant learning theories and activities for Disaster ECE

Learning	Theory/Pedagogy	Relevance	ECE Activities
Behavior	Planned program	Practice necessary behaviors before a disaster	Preparedness training, drills,

Cognitive	Information Processing	Disaster information needs to be processed to trigger appropriate behavior (Disaster information needs to be conveyed in order to elicit appropriate behavior)	Alert messages, social media, media releases, signage, crowdsourcing
	Gestalt theory (explains how people learn through perception, decision making, attention, memory, and problem solving)	Risk perception, decision making, attention, memory, and problem solving are all important requirements for appropriate disaster behavior	Awareness-raising documents and websites (e.g. risks, preparedness measures), role-plays related to disaster scenarios, maps
	Constructivist	People build learning from disaster information and experience	Oral history, social media, diaries, personal research
Affective	experience	Previous or learned experience is an important factor in community disaster preparedness and resilience	Games, simulations, virtual reality training, sports
	Social and emotional	Emotional factors play an important role in people's readiness and resilience	Workshops, SEL programs in schools, resilience therapy, social media, counseling
	transformational	People may need to change to prepare for future disasters	Role playing, disaster case studies, thought exploration, critical reflection
Social	Co-located learning/community of practice (Learning through community)	Social capital has been proven to be a major factor in community resilience	Social media, post-disaster community meetings, resilience forums, community involvement

Source:(Dufti, 2020)**.**

Thus, the involvement of communication and education in the context of disaster is important and can be analyzed based on learning theories. Each learning theory has a unique approach and can be analyzed to examine the process of transferring disaster knowledge in the context of creating a disaster resilient society.

Development of Disaster Communication Research

Disaster communication research has been around for a long time. Disaster issues always exist along with the number of disasters that occur, government policies related to disaster management and the emergence of organizations with concerns about disaster studies. Preston, 2012 in(Dufti 2020) explains that the boundaries of the discipline of disaster education are very fluid and similar studies are often found in the fields of disaster sociology, public health and health promotion, political communication and public relations. Research focused on disaster communication can combine other scientific disciplines including education, psychology and sociology in understanding human reactions to disasters.

Research related to disaster communication can be grouped starting from pre-disaster, during disaster and post-disaster. Various approaches are used to explore the phenomenon of disasters, including how people perceive disasters and public literacy regarding disasters. In general, disaster communication research topics are related to disaster mitigation, disaster mitigation literacy, local culture, social media, disaster management policies and disaster education. Moreover, the presence of social media opens up new space for research in the field of disaster communication.

The research focused on how social media was used during Tropical Cyclone Winston, the strongest tropical storm ever recorded which left devastation and devastation in Fiji during February 2016. The results found people used social media to share information about the cyclone, individuals also shared their experiences during the cyclone happened through social media until the hashtag #StrongerThanWinston appeared which was used as a form of support and a sense of national solidarity(Glen Finau, Jope Trai, Renata varea, Jason Titafanua 2018). In addition, research investigating how social media is used during flood disasters is managed by government agencies. The results obtained show that it is necessary to improve disaster communication through social media, including the use of ethical communication to suppress rumors or misinformation during disasters.(Lovari and Bowen 2020). Similar to research carried out by(Mirbabaie et al. 2021)which investigates the concept of Nudging as a form of behavioral adjustment to overcome communication barriers. The results show that Digital Nudging in Social Media is a promising approach for use in emergency and disaster communications.

In addition, research on disaster communication in Indonesia is starting to emerge. First, to analyze the government's disaster mitigation communication, in this case the West Java Province Regional Disaster Management Agency (BPBD) in dealing with the earthquake caused by the Lembang fault. The results obtained were a socialization program for disaster-prone areas, disaster response training, creating educational media for school children (animated videos). Unfortunately however, these programs have not been implemented intensively by the West Java BPBD, which do not yet have a disaster mitigation communication team that focuses on providing understanding to the public about the risk of earthquake disasters caused by the Lembang fault.(Iqbal et al. 2021). Meanwhile research on PetaBencana.id found that in disaster communication its role is limited to the role of surveillance. Sulaiman in his research analyzed the role of surveillance and real-time data intervention in the implementation of the PetaBencana.id platform and disaster management strategies in Indonesia by taking a case study of the Jakarta flood in early 2020. The research results show the intervention of surveillance technology and visual data presented by PetaBencana.id is a way to change people's attitudes and behavior so that they are directly involved in the development of their environment(Sulaeman 2021).

Furthermore, research related to social media literacy and disaster literacy in Bali shows that the majority of people in Bali do not have sufficient digital disaster literacy. This is shown by the low number of people who verify or confirm the disaster information they receive. Ironically, people tend to share information about the Mount Agung disaster without verifying it. The anxiety and feelings of insecurity they feel are mostly caused by the large amount of information about Mount Agung circulating on their social media. This is made worse by the speed at which information about Mount Agun circulates on social media without any information or verification(Gelgel 2020).

Thus, there is quite a lot of research in the field of disaster communication studies. However, there is still little research using an educational approach in disaster communication. Although in several countries there have been research that suggests disaster education models that are starting to be implemented by the government both through school and community-based curricula. However, in Indonesia itself, there are still very few. In the next discussion, the author will describe the results of research related to educational approaches in disaster communication that have been carried out in various countries.

Implementation of Disaster Education Concepts in Various Countries

Education is a strategic forum for introducing about disasters and their risks to every student so that they can create a society that is aware of disasters. Risk education for disasters or more popularly known as disaster education or disaster risk education is a process of building awareness that starts from building knowledge, understanding and actions that encourage preparedness, prevention and recovery.(Lilik Tahmidaten 2019). Various countries are starting to implement and include disaster education in the school level learning curriculum. This is an effort to provide early education to individuals regarding awareness of natural disasters and creating a disaster resilient society. Meanwhile in Indonesia, disaster education has not been fully internalized in school, campus or community learning, it is still limited to discourse and plans.

In implementing disaster education, there are five dimensions of disaster education when included in the disaster curriculum including (a) understanding the nature and mechanisms of natural

disasters, (b) understanding and practicing safety measures and procedures, (c) being able to understand the factors that cause risks and how small or simple dangers can become disasters, (d) building a culture of safety and institutional resilience and broad communication(Selby and Kagawa 2012). This chapter will describe the implementation of disaster education in several countries. How the issue of disasters becomes important and the state views this as a threat, so it is important to provide education from an early age regarding the dangers of disasters. However, in its implementation, various obstacles and constraints were found in the field.

a. **Disaster Risk Education (DRR) in Bangladesh**

Bangladesh is integrating DRR into the school curriculum. The results of this research show that there are efforts to provide disaster risk education from an early age, but many factors cause this program to be hampered. The curriculum cannot run smoothly because the number of children dropping out of school is very high. Not only are there problems at the student level, but also at the educator/teacher level. There are still many teachers who do not understand the DRR curriculum. Apart from that, the learning system only reaches the level of theory (facts), not prioritizing improving skills or providing an effect on attitudes and changing behavior.

b. **Implementation of Disaster Education in Cambodia**

The disaster education implementation policy is implemented in schools at level 8 and is included in the Geography and Earth Studies curriculum. However, in reality, most students tend to drop out of school before grade 8 so not all students get this material. However, a series of innovative-based curriculum development projects continue to be carried out and teacher capacity building is also being increased.

c. **Development of the Disaster Risk Education curriculum in Pakistan**

In 2014, curriculum development experienced a transition from the national curriculum to the provincial curriculum (decentralized). This has implications for the role of development institutions in supporting the DRR curriculum in Pakistan. The policy of integrating DRR into the curriculum is provided to all levels. Increasing teacher capacity is also being carried out but not continuously(Selby and Kagawa 2012).

Based on the description above, it shows that the three countries have implemented DRR or Disaster Risk Education. However, in its implementation there are many obstacles and challenges from the aspects of students, teachers and also the local government as well as a social environment that is not yet fully supportive. The factor of children dropping out of school is one of the obstacles to disaster risk education spreading throughout society.

Lastly, disaster education is also implemented in Japan, known as Disaster Education (DE). A country that has a long history of disasters. The integration of disaster education is also quite long in line with the disasters experienced by the country. The educational model applied is to prioritize how students appreciate the relationship between humans and nature when raising awareness of the dangers of disasters and not just instilling reactions to dangerous natural phenomena. In more detail, the education authorities in Japan focus on 3 things in educating Japanese citizens regarding disasters, namely everyday safety, traffic safety and disaster safety.(Kitagawa 2014).

Meanwhile in Indonesia, most educational circles are starting to become familiar with disaster education. Especially in schools located in areas prone to natural disasters, such as Aceh, Yogyakarta, Padang and so on. In disaster-prone areas, the government and NGOs often provide disaster outreach. However, it is still incidental, after the disaster until reconstruction and society returns to normal. In fact, disaster education should be provided continuously, considering that Indonesia is prone to natural disasters. Until now, several schools have started to carry out outreach and provide disaster materials and also several private institutions that monitor campuses are holding outreach to campuses for disaster education.

CONCLUSION

a. Disaster communication and education are interrelated in order to increase disaster literacy throughout the region.

b. Communication plays a major role in disaster education programs, both from the government as a policy maker, institutions that monitor disaster issues and the community (disaster victims). Effective, efficient and targeted information traffic is needed both pre-disaster, disaster and post-disaster.

c. There is a need to integrate disaster education into the curriculum at both school and campus levels. So that each individual knows and understands what to do when a disaster occurs, how we perceive disasters and so on.
d. The field of disaster communication research studies still allows for development, especially disaster education approaches.

REFERENCE

Adiyoso, Wigno. 2018. *Manajemen Bencana: Pengantar Dan Isu-Isu Strategis*. Jakarta: Bumi Aksara.

Agus Idiyanto, Arqom Kuswanjono, ed. 2012. *Konstruksi Masyarakat Tangguh Bencana*. Bandung: PT Mizan Pustaka.

Badan Nasional Penanggulangan Bencana. 2022. "Geoportal Data Bencana." *BNPB*. https://gis.bnpb.go.id/.

Dufti, Neil. 2020. *Disaster Education, Communication and Engagement*. Australia: Molino Stewart Pty Ltd. https://www.ptonline.com/articles/how-to-get-better-mfi-results.

Gelgel, Ni Made Ras Amanda. 2020. "Media Sosial Dan Literasi Kebencanaan Di Bali." *Interaksi: Jurnal Ilmu Komunikasi* 9(1): 19–30.

Geologi. 2019. "Kementerian Energi Dan Sumber Daya Mineral: Badan Geologi."

Glen Finau, Jope Trai, Renata varea, Jason Titafanua, Romithes Kant. 2018. "Social Media and Disaster Communication: A Case Study of Cyclone Winston." *Pasific Journalism Review* 24(1): 123–37.

Herliani, Didisminus Tanah Boleng, Elsye Theodora Maasawet. 2008. *Teori Belajar Dan Pembelajaran*. Jawa Tengah: Lakeisha. http://repository.uin-malang.ac.id/6124/.

Hilft., Bündnis Entwicklung. 2018. WorldRiskReport 2018: Child Protection & Children's Rights *World Risk Repost 2018*.

"Indonesia Negara 'supermarket' Bencana _ Merdeka." 2015. https://www.merdeka.com/khas/indonesia-negara-supermarket-bencana-wawancara-kepala-bmkg.html.

Iqbal, Mochamad, Vikry Abdullah Rahiem, Charisma Asri Fitrananda, and Yogi M Yusuf. 2021. "Komunikasi Mitigasi Bencana (Studi Kasus Mitigasi Bencana Badan Penanggulangan Bencana Daerah Provinsi Jabar Dalam Menghadapi Bencana Alam Gempa Bumi Akibat Sesar Lembang)." *Linimasa: Jurnal Ilmu Komunikasi* 4(2): 2021.

Jati, Wasisto Raharjo. 2012. "Analisis Penanggulangan Bencana Berbasis Perspektif Cultural Theory." *Jurnal Dialog Penangguangan Bencana* 4(1): 1–70.

Khambali. 2017. *Manajemen Penanggulangan Bencana*. Yogyakarta: CV Andi Offeset.

Kitagawa, Kaori. 2014. "Continuity and Change in Disaster Education in Japan." *History of Education* 44(3): 371–90. http://dx.doi.org/10.1080/0046760X.2014.979255.

Lestari, Puji. 2018. *Komunikasi Bencana; Aspek Penting Pengurangan Risiko Bencana*. Yogyakarta: PT Kanisius. http://eprints.upnyk.ac.id/23779/1/Puji Lestari - Buku Komunikasi Bencana Aspek Penting.pdf.

Lilik Tahmidaten, Wawan Krismanto. 2019. "Implementasi Pendidikan Kebencanaan Di Indonesia (Sebuah Studi Pustaka Tentang Problematika Dan Solusinya)." *Lectura: Jurnal Pendidikan* 10(3).

Lovari, Alessandro, and Shannon A. Bowen. 2020. "Social Media in Disaster Communication: A Case Study of Strategies, Barriers, and Ethical Implications." *Journal of Public Affairs* 20(1).

Mirbabaie, Milad et al. 2021. "Digital Nudging in Social Media Disaster Communication." *Information Systems Frontiers* 23(5): 1097–1113.

Selby, D, and F Kagawa. 2012. United Nations Childres's Fund *Disaster Risk Reduction in School Curricula: Case Studies from Thirty Countries*. http://www.unicef.org/education/files/DRRinCurricula-Mapping30countriesFINAL.pdf.

Sulaeman, Trian. 2021. "Peran Surveillans Dalam Pemberdayaan Masyarakat : Studi Kasus Petabencana.Id." *Intelektiva: Jurnal Ekonomi, Sosial & Humaniora* 2(07): 50–59.

Sung-Chin Chung. 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." *Journal of Life Sciences* 10(4): 203–14.

Syamsidik. 2019. "Aceh: Pasca Lima Belas Tahun Tsunami : Kilas Balik Dan Proses Pemulihan. Banda Aceh-Indonesia: Tsunami and Disaster Research Center (TDMRC)."

Ulum, M. Chazienul. 2014. *Manajemen Bencana : Suatu Pengantar Pendekatan Proaktif*. Malang: UB Press.

UU RI Nomor 24 Tahun. *Undang-Undang Republik Indonesia Nomor 24 Tahun 2007*. 2007.