

Actor-Network in Disaster Education: Mainstreaming the Role of Higher Education in Climate Resilience for Sustainable Development in Northern Thai School

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Abstract

Frequently, global disasters occur due to human-induced activities, involving international society's role in attempting disaster risk reduction. This study aimed to examine the current state of Thai disaster education at the school level, which Japan supports, and analyze higher education's role in enhancing school-level disaster education through Bruno Latour's actor-network theory (ANT). A mixed-method approach was employed in this study. Quantitative data were gathered through questionnaire surveys involving 150 students aged 13 to 15 from mountainous regions. The surveys focused on their knowledge, attitude, and disaster self-appraisal practices (KAP) in rapid-onset circumstances, using percentages and numerical values. In contrast, the qualitative data were collected through in-depth interviews with five key informants and analyzed using content analysis. The students exhibited a high level of knowledge, while their attitude was assessed at the medium level, and their practical implementation was statistically low. This reflects a significant emphasis on Thai disaster education in rapid-onset situations. Nevertheless, slow-onset disasters, particularly drought and clean water supply issues, have the most profound and adverse impacts. ANT highlights the inseparable relations between human and non-human actants, encompassing government, higher education, schools, technology, and knowledge engagement in climate resilience building. The study findings provide guidance for all stakeholders, including government, higher education institutions, and schools, to transition their training or education programs from a rapid-onset to a slow-onset approach. This involves promoting the collaboration between higher education and its external partners to develop water management education initiatives that cultivate lifelong learning skills and contribute to achieving Sustainable Development Goals 3 Good Health and Well-being.

Keywords: Higher education, actor-network theory, climate resilience, Japan, Thailand

Introduction

In recent years, Thailand has encountered numerous major natural disasters. These include the Indian Ocean Tsunami in 2004, flooding in 2011, an earthquake in 2014, droughts in 2015 and 2016, as well as challenges like reduced rainfall, declining fisheries and agriculture, and sea-level rise. Notably, the northern mountainous region of Chiang Rai has been particularly affected

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(Nasaku, 2017). Chiang Rai was additionally hit by an earthquake in 2014, resulting in the destruction of 115 school buildings (UNICEF, 2016). Subsequent occurrences of floods, droughts, and landslides further exposed the region's increasingly vulnerable population, particularly its children, to challenging conditions.

Continuously, children remain the most susceptible to the adverse outcomes of disasters, including injuries, illnesses, and abuse. They are also physically more vulnerable to mortality (Peek, 2008). Therefore, it is critical to include children in disaster preparation efforts to foster resilience. Following the Hyogo Framework for Action (HFA) 2005–2015, disaster education has played a pivotal role in disaster preparedness (UNISDR, 2007). An intriguing finding highlighted by Shaw et. al. (2011) in their book “Disaster Education” emphasizes that such education enhances children's awareness and equips them with suitable and effective responses when facing disasters. The tale of Tilly Smith, a 10-year-old British schoolgirl who warned tourists to evacuate the area as the Indian Ocean tsunami approached the shore in 2004, stands out as one of the most well-known illustrations of the impact of education and information. A couple of weeks prior to her trip to Thailand, Tilly had studied the tsunami phenomenon during her geography class, enabling her to recognize warning signs. Despite her lack of expertise in disaster, this young child managed to save numerous lives. Consequently, this essay asserts that disaster education is crucial for fostering a sustainable safety culture in school environments. The investment in preventing disasters proves significantly more cost-effective, especially when it comes to preserving the lives of children.

The effective implementation of disaster education requires the active involvement of all relevant stakeholders, including both human and non-human entities. Bruno Latour's Actor-Network Theory (ANT) facilitates a discourse that encompasses both human and non-human actors within the realm of disaster education. The generation of knowledge assumes a pivotal role in fostering disaster awareness, with higher education institutions playing a significant part in this endeavor. These institutions have notably contributed through various means, such as research, educational training programs aimed at enhancing resilience and lifelong learning skills, as well as the formulation of policy recommendations (Suindramedhi, 2015; Suwanmolee, 2016). Higher education institutions are actively engaged in the process of reconstruction within their local communities. They fulfill a public function as established non-governmental organizations and contribute to this effort by deploying long-term volunteers and providing various forms of

assistance (Shaw, et al., 2011; Thanyaparan, et al., 2014). There is a lack of adequate representation in the existing body of research about the significance of higher education in the context of disaster risk reduction. Consequently, this study aims to comprehend existing disaster education and to promote the integration of higher education with various stakeholders, thereby enhancing its capacity to contribute to the generation of knowledge and the development of lifelong learning competencies within the context of disaster management in Thailand. The acquisition of information in higher education emerges as a significant factor with other human actors in fostering resilience and reducing the impact of catastrophic outcomes. Consequently, both human and non-human actants have equal significance and exhibit adaptability.

Recent studies in higher education employing ANT have examined how higher education functions as an independent academic institution, exploring its philosophical ontology and epistemology (Dickinson, 2019; Tummons, 2021). Nonetheless, this study highlights the ontological paradigm shift advocated by Thomas Kuhn, predicting rapid-onset to slow-onset catastrophes (1962). This study underscores two crucial disaster components: higher education as a human representative and knowledge as a representation of non-human entities.

Global communities, such as Japan, a prominent leader in disaster management, hold a substantial role in advancing disaster education, aligning with their central goal of prioritizing human security. Following the 2004 Indian Ocean Tsunami, Japan has considerably contributed to disaster education and relief initiatives in Global South countries, particularly Thailand. This assistance includes the establishment of model schools focused on disaster preparedness (Lin & Lin, 2017; Makishima & Yokoyama, 2010; UNICEF, 2016).

In alignment with this, Thailand has integrated a disaster education curriculum starting sixth grade of elementary school, encompassing both scientific and social science aspects. Additionally, there is an extracurricular disaster program concentrating on rapid-onset situations like tsunamis, earthquakes, floods, and landslides (MoE, 2008). In Japan, higher education, along with government bodies and other stakeholders, constitutes a crucial element of the disaster socialization system (Suindramedhi, 2015). As a consequence, higher education plays a pivotal in the endeavor to diminish catastrophe risk and enhance resilience.

With a substantial body of research focusing on the role of higher education in disaster management, particularly within Japan, this study introduces an additional case study examining the involvement of higher education in Thailand. This aspect remains underrepresented in

academic research. Therefore, this study aims to revolve around two main research inquiries: 1) To what extent do knowledge, attitudes, and practices (KAP) interrelate in the context of disaster education in Northern Thailand? 2) How are stakeholders interconnected in the process of integrating disaster education through ANT?

Literature Review

Climate Change and Disaster Risk Reduction: From Hyogo – Bangkok – Sendai

While it's impossible to entirely prevent or avert natural disasters, individuals can make preparations and refrain from climate-change-induced behaviors to mitigate the risks associated with such catastrophes. This approach aligns with the commitment of each nation to collectively achieve disaster risk reduction and climate change adaptation goals, supported by the empowerment principles established by the United Nations Worldwide Strategy for Disaster Risk Reduction (UNISDR) international platform (Chatterjee et al., 2015). The World Conferences on Disaster Risk Reduction (WCDRR) brought together members of representatives from the global community to exchange their experiences in disaster risk reduction. This collective effort aims to prevent expensive trial and error in disaster management and to play a pivotal role in diminishing disaster risk while fostering a culture of safety within communities (Delshad et al., 2020).

The first WCDRR concluded in 1994 with the Yokohama Strategy and Plan of Action for a Safer World. The second WCDRR, which ended in 2005, led to the establishment of the Hyogo Framework for Action (HFA) 2005–2015: Strengthening Countries and Communities' Resilience to Disasters. The third WCDRR, concluding in 2015, resulted in the formulation of the Sendai Framework for Disaster Risk Reduction 2015–2030 (UN, 2005; UNFCCC, 2017). Since 2005, Thailand has actively participated in the global disaster risk reduction movement. In alignment with its commitment to the HFA, Thailand launched the Bangkok Declaration on Disaster Risk Reduction in Asia and the Pacific in 2014.

Derived from the HFA, the Bangkok Declaration urges governments and stakeholders to:

(1) enhance local resilience; (2) increase public investment in disaster and climate risk management to safeguard and sustain development gains; (3) encourage private sector engagement – public-private partnerships for disaster risk reduction; (4) promote the utilization and development of science, technology, and innovation for disaster risk reduction; and (5) enhance governance, transparency, and accountability (Chatterjee et al., 2015; DPPCM, 2015). The

Bangkok statement highlighted the crucial role of a people-centered development model in both disaster risk reduction and climate change adaptation. This approach helps mitigate the impacts of uncertainty and enhances the self-resilience of local communities (DPPCM, 2015).

To enhance the Sendai Framework for Disaster Risk Reduction, as outlined by Chatterjee, Shiwaku, Gupta, Nakano, and Shaw (2015), the Bangkok Declaration identified four essential groups requiring empowered: 1) local governments, 2) children and youth, 3) science and technology, and 4) private sectors involving businesses and industries. These four pivotal entities are acknowledged for their involvement in local development planning, their promotion of comprehensive school safety advocacy, and their efforts to foster disaster-resilient towns and villages through the establishment of community-based support networks (De la Poterie & Baudoin, 2015). As a result, Japan played a crucial role in shaping an international framework for disaster reduction, which in turn inspired Thailand to actively engage in this endeavor. Also, both Thailand and Japan continue to participate in DRR efforts.

Role of Higher Education in Disaster Management in Japan and Thailand Context

As a professional development organization, the presence of higher education institutions (HEI) has substantially enhanced the organization's involvement in emergency management, strengthening disaster response and recovery operations. HEIs possess localized experience and relationships that enable effective communication with local communities. In contrast, other disaster response organizations often lack access to local individuals due to their regional or centralized structures (Miller & Denham, 2020). Consequently, HEIs can fulfill a portion of their civic responsibilities by actively collaborating with local emergency management, assisting in disaster response, and enhancing public safety and access to communal areas. The HEI could expand its educational and outreach initiatives to reduce local risks, consequently enhancing general risk reduction and household resilience. As per Shaw, Mallick, and Takeuchi (2011), the Conference of European Rectors (CRE) integrated HEI into the Charter for Sustainable Development in 1995. Subsequently, environmental and disaster-related concerns have evolved into actions, behaviors, and abilities necessary for lifetime learning (Thayaparan et al., 2014). Adult education receives a substantial portion of funding for lifelong learning due to its impact on the country's Human Development Report (HDR), supported by the OECD (Atchoarena, 2021; McGrath & Deneulin, 2021).

The phrase “lifelong learning” refers to the idea of economic learning, where economic factors such as competition and labor adaptability have caused a shift from a human-centered perspective to one that is more materialist and market-driven (Atchoarena, 2021). Nonetheless, the findings of the 1995 CRE propelled higher education to adopt “green environments and curricula” as integral aspects of lifelong learning. In Japan, the concept of lifelong learning (*shogai gakushu*) was introduced in 1971 through a government report aimed at addressing three pivotal social concerns: an aging population, community development, and economic transformation. It was institutionalized in 1924 under the Ministry of Education's Foundation of Social Education Division (MEXT, 1981; Rausch, 2003). In the Japanese context, lifelong learning has provided learners with the opportunity to engage in self-enrichment and enhance their quality of life by studying freely whenever, whatever, and however they desire, according to their needs at various life stages (MEXT, 1981). Lifelong learning in Japan encompasses all facets of education and learning, spanning from preschool to secondary school, as well as informal learning (Maruyama, 2009). Additionally, it includes continuous learning related to disaster preparedness, which is established from elementary to secondary school levels (Kitagawa, 2015).

According to Shiroshita (2018), by 2008, Japan had established 51 academic institutions dedicated to disaster management, with 57% of them being established since the year 2000. Sports and volunteer activities are incorporated into the practice of lifelong learning (Maruyama, 2009). This has resulted in an upsurge in volunteerism, particularly in response to disasters, as evident in the increased volunteer engagement during the 1995 Hanshin-Awaji earthquake (Kitagawa, 2016). Likewise, lifelong learning has been a longstanding tradition in Thailand, with locals passing on life skills from one generation to the next (Sungsri, 2009). Moreover, it has been integral to every stage of the Thai national policy and development plan since 1940. Lifelong learning was formally recognized in 1977 through its inclusion in the Thai National Education Plan (Luka & Sungsi, 2015). The motto “lifelong learning for everyone,” the motto of Thai educational goals, was revitalized in 1999 through the National Act (Luka & Sungsi, 2015; Sungsi, 2009). Despite the infrequency of catastrophes in Thailand, disaster education was integrated into the 2008 Core Education Curriculum. Furthermore, its significance was heightened by Japan's Official Assistance for Disaster Education guideline in 2012 (Wongphyat & Tanaka, 2020).

In contrast to Japan, Thailand's involvement in higher education is underdeveloped, despite the fundamental similarity in conducting research and engaging in community resilience building.

Notably, the only study publication on higher education by Wongphyat and Tanaka (2020) contributes to the institutionalized educational lessons drawn from Japan, standing as the sole reference in this context. To address the limitations of Thai higher education, Shaw et al. (2011) explained that the presence of the Asian University Network for Environment and Disaster Management (AUNDM) empowers universities to acknowledge the pivotal role of offering education and research focused on practical implementation in the realms of environmental and disaster risk reduction. Hence, networking stands as the sole avenue for Asian nations to share information and experiences, fostering a regional knowledge foundation that can be translated into action and policy recommendations. Particularly, this networking between universities in Japan and Thailand plays a significant role in overcoming challenges related to disaster risk reduction.

Actor-Network Theory in Climate Regimes

Within the crisis management cycle, establishing the sequence of actors and agencies along with their responsibilities holds paramount importance. The term “agency” or “agents” is employed to differentiate an agent's capacity, frequently highlighted in human participants, to impact larger social connections (Dwiartama & Rosin, 2014). Latour's actor-network theory facilitates a comprehensive understanding and collaboration between humans and non-human entities within an assemblage, referred to as actants (Elder-Vass, 2019). In his work “Down to Earth: Politics in the New Regime,” published in 2018, he advocated for a shift towards a “middle-ground” state where humans and non-humans engage on equal terms, incorporating the intricate network of interconnections that collectively sustains life on Gaia's Earth (Latour et al., 2018). A central tenet of ANT is its refusal to adhere to numerous binary distinctions, such as those between human and non-human, society and nature, and subject and object (Latour, 1993). In accordance with Latour (2005), ANT represents a post-structuralist social perspective that explores a society comprising not only humans or individuals but also their interactions with the material elements that encompass them. Furthermore, ANT is characterized as both a theoretical and empirical framework employed to analyze the interactions among entities within diverse social or natural networks (Yang et al., 2022).

One of ANT's distinctive features is its assignment of agency to non-human entities such as animals, materials, ideas, knowledge, concepts, nature, and technology. This recognition acknowledges the potential of any entity or actant to play a vital role in maintaining the network's

existence and its connections with other elements (Dwiartama & Rosin, 2014). In this sense, ANT perceives nature, technology, culture, and other non-human components as facets of shared existence rather than as distinct ontological entities (Neisser, 2014). It is inconceivable to imagine an educated and skillful human being unconcerned with the objects, tools, and materials he or she works with. Applying ANT as an analytical framework allows us to comprehend the factors that connect elements, enabling their functioning (Latour, 1990). In this study, ANT is utilized to evaluate human and non-human entities, organized into two separate social and infrastructural systems (Yang et al., 2022). The term “social” refers to human actors in a social environment or assemblage, while “infrastructure” refers to a non-human actor in a social assemblage or network, which are linked and reliant on human involvement for their functionality.

Within Japan's disaster management, human actors include the following: 1) schools, 2) museums or disaster learning centers, 3) volunteer groups, 4) local communities, 5) government bodies, and 6) universities or research institutes. Non-human actors in this context encompass the following: 1) policies or regulations, 2) knowledge, 3) technology, and 4) values that support efforts toward disaster risk reduction (Suindramedhi, 2015; Cabinet Office, 2021).

The initial stage involves analyzing the interactions between humans and non-humans within Japan's socialization system or assemblage. The government executes disaster management policies and regulations as a component of its managerial obligations. The policy or legislation can be implemented by five additional actors: higher education, schools, museums or catastrophe learning centers, volunteer organizations, and the local community. Additionally, the non-human actor of technology plays a role in this process. The policy or law sets out the vision and objectives for an additional five human actors and one non-human actor engaged in disaster management and risk reduction. Indeed, technology influences the government's approach to disaster preparedness, particularly through early warning systems (Nygard et al., 2018). Furthermore, there is a reciprocal relationship between technology and knowledge, with each contributing to the other's development.

As mentioned earlier, the primary role of higher education is to cultivate knowledge generation and volunteerism to strengthen resilience. Moreover, higher education holds a pivotal function in producing both knowledge and technology. Additionally, knowledge, particularly the output of higher education, is instrumental in educating teachers, students, and the local community about disasters. Suindramedhi's (2015) study, for example, discusses a concrete example from Bunkyo

Gakuin University and its demonstration school, Bunkyo Gakuin University Girls' High School. In this example, students are exposed to disaster preparedness culture through the enhancement of a life survival kit. This kit includes canned food with a five-year shelf life and an ample supply of sustenance for a three-day consumption period. Similarly, Kumamoto University tailors a variety of disaster management education initiatives according to the university's distinct topography, geology, and societal context. It collaborates with educational programs and materials in collaboration with educational institutions, institutions such as elementary, junior high, and high schools, as well as municipalities and volunteer organizations committed to disaster risk reduction, to formulate educational programs and resources (CWMD, 2016). Furthermore, higher education generates information that is disseminated among the local population to mitigate catastrophe risk. Additionally, the local community possesses its own indigenous knowledge that has evolved into a source of community pride. For instance, practices like *Machizukuri*, or urban design, are geared towards mitigating the impacts of climate change and disasters (Sato, 2019).

Also, values can affect volunteers in Japan, with a peak observed in 1995 (Yamamura, 2013). Moreover, university-generated disaster information plays a substantial role in the establishment of museums or disaster learning centers, and conversely, these centers contribute to disseminating information from universities. The museum serves as a platform to impart disaster knowledge to schoolchildren, university students, and the local community. The actor-network pattern of the socialization system employed in Japan's disaster management is illustrated in Figure 1.

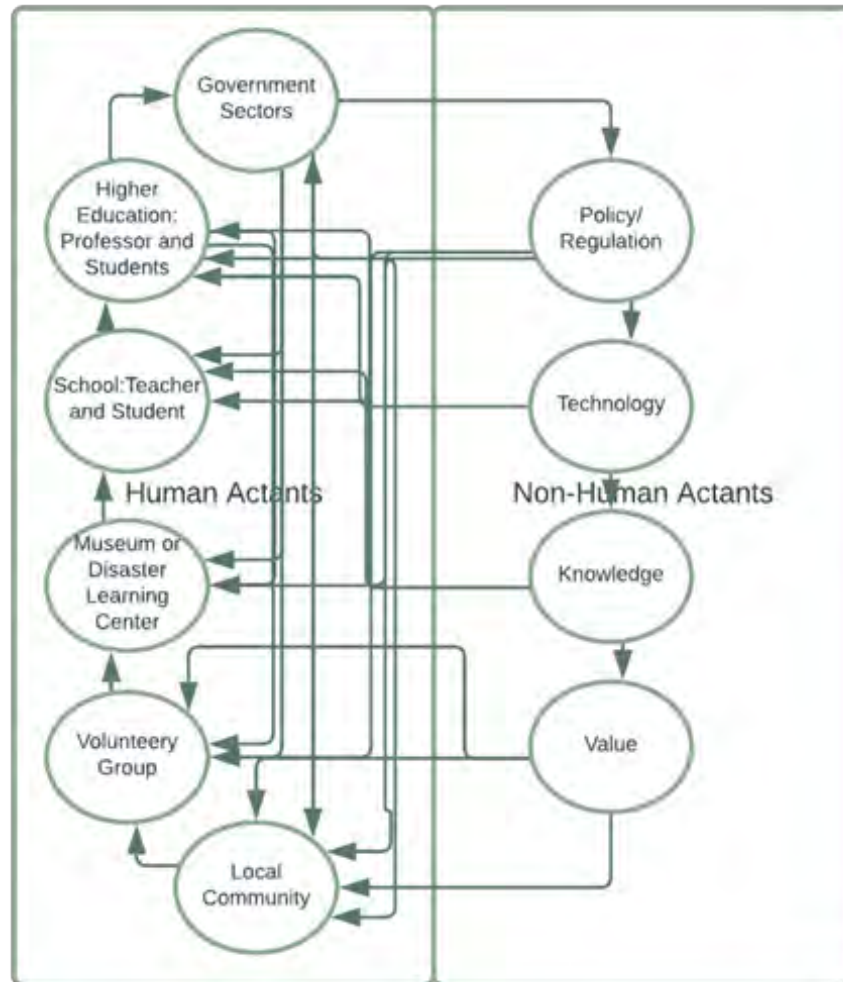


Figure 1. Actor-Network and its Interdependency in Disaster Management in Japan

Method

Research Design

The research adopted a hybrid approach involving both quantitative and qualitative methodologies, with a specific emphasis on explanatory sequence design (Shorten & Smith, 2017). The study included a quantitative method to assess the knowledge, attitude, and practices (KAP) components of existing disaster education among students. Furthermore, a qualitative technique was employed to provide deeper insights into the responses obtained from the quantitative questions. The survey gathered demographic data along with information pertaining to three dimensions: knowledge, attitude, and practice. The knowledge dimension comprised six questions, the attitude dimension encompassed seven questions, and the practice dimension included six questions. The utilization

of mixed methods research enabled the exploration of connections between the existing disaster education curriculum and the necessity to enhance the quality of disaster education in Thailand. Furthermore, the qualitative methodology exhibits adaptability in accommodating the reciprocal effect and the significance of patterns between the researcher and the participants (Fitri, 2022). The qualitative technique was manifested through the utilization of an in-depth interview. The ANT framework was applied to elucidate the importance of stakeholders in the process of integrating disaster education into lifelong learning.

Participants

This research involved 150 schoolchildren aged of 13 to 15 (under 18 years categorized as children [UN, 2010]), with 75 students from Doi Mae Salong, an area prone to landslides, floods, and drought, while the remaining 75 were from Mae Chan, which experiences earthquakes and floods. Furthermore, this study included five key informants from both schools, school executives, and teacher-related disaster education professors from Japan and Thailand, who were selected through purposive sampling. The population size was determined using the following Yamane's (1967) formula.

Formula: $n = \frac{N}{1 + Ne^2}$ The meanings are n = sample size N = population e = confidence level (95%) N=240 with a margin of error of 5 percent
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Figure 2. The Yamane Formula Calculation

The obtained 150 school children were utilized for the collection of quantitative data, while qualitative data was derived from the five key informants. Prior to the questionnaire administration, individuals within the target population were informed about the research objectives and requested to grant their consent. Participants were granted verbal permission to participate. The researcher ensured the confidentiality of the data by maintaining anonymity in the

questionnaire, abstaining from disclosing the identities of the study units, and avoiding the personal distribution of the questionnaire. The questions were completed using a coding process, with no personal identifiers present on the questionnaires. The codes were securely stored in a secure designated area referred to as a coded drawer. This meticulous approach ensured the preservation of information confidentiality.

Instruments and Data Collection

This research employed a cross-sectional study design for data collection. This study was conducted in Doi Mae Salong and Mae Chan, situated in Chiang Province, in the northern part of Thailand. These areas are positioned along an active fault line, making them susceptible to common disaster types such as earthquakes, floods, and landslides. Two research instruments were used: a survey questionnaire and an in-depth interview conducted between December 2021 to January 2022. The survey questionnaire encompassed Knowledge (K), Attitude (A), and self-assessment in the Practice of disaster situations derived from the framework of Bloom et al. in 1956, which focuses on fostering student's cognitive, affective, and psychomotor (Bloom et al., 1956).

The KAP survey aimed to shed light on the school pupils' comprehension of disaster-related aspects. The knowledge component gauges their general understanding of disasters and potential risks, along with their preparedness for future disasters. The attitude section investigates participants' perceptions and responses to disasters, while the practice component delves into their practical knowledge of mitigation during such events. The KAP survey reinforces the connection through meticulous construction of questions for each individual sample, as highlighted in prior studies (Anh et al., 2005; Lwelamira et al., 2012; Songlar et al., 2019).

The students were asked to deliver their experience on disaster education given by the schools in intra-curricular and extracurricular activities relevant to school safety development and disaster risk reduction efforts. The questionnaire is divided into six items for knowledge, seven for attitude, and six for disaster practice. The final section consists of an open-ended questionnaire consisting of three items. The outcomes of the KAP survey, represented by the mean scores, are interpreted based on classification categories outlined by Sri-Saad (2010). These categories include: "4.51 – 5.00 = very high," "3.51 – 4.50 = high," "2.51 – 3.50 = medium," "1.51 – 2.50 = low," and "1.00

– 1.50 = very low.” Additionally, five more key informants were sourced from two schools: Japanese University and Thai University.

The researchers obtained permission from two schools to collect the data through a formal request letter. Prior to conducting fieldwork, the researcher provided an explanation of the research's background and objectives, underscoring the potential impact and benefits of participating in the data collection process. Concurrently, permission was sought from the five key informants affiliated with two institutions – a Japanese university and a Thai university – to conduct interviews. The in-depth interviews extended from 45 to 60 minutes and followed a semi-structured format, featuring open-ended questions. In addition to conducting interviews, secondary data from academic journals, articles, policies, regulations, and other pertinent documents related to disaster education, the role of higher education, KAP, and ANT were utilized to ensure a comprehensive analysis of the study.

Data Analysis Procedures

The collected data underwent analysis, encompassing descriptive statistical measures such as percentage, frequency, standard deviation, and mean. This analysis was performed using the Statistical Package for Social Sciences (SPSS) version 20. The software was also employed for inferential statistical analyses to determine whether a significant association existed between school pupils (dependent variable) and social-demographic and attitudinal variables, as well as disaster events (independent variable).

Moreover, regression analysis was utilized to investigate the relationship between the three paradigms of KAP related to disaster and the geographical locations of schoolchildren in the mountainous areas of Doi Mae Salong, characterized as a high seismic zone, and Mae Chan, classified as medium-low seismic districts (Jintrapasat & Thitimakorn, 2017). The analysis was conducted with a significance level of $p < 0.05$. The interview and secondary data were examined through content analysis in accordance with the analysis, employing keywords related to disaster education, higher education, KAP and ANT. This content analysis approach was guided both by theoretical and empirical foundations established in the literature review (Stemler, 2015).

Result and Discussion

Social Demographic, KAP and Its Relationality for Disaster Education

The social demographics of the respondents play a crucial role in their connection with existing disaster education and preparedness. As depicted in Table 1, the study involved 150 participants, consisting of 78 girls (52 percent) and 72 boys (48 percent). The age range of the participants was between 13 and 15 years. Among them, 96 students (63 percent) fell within the 13 to 14 years age bracket, while 54 students (36 percent) were between 14 and 15 years old. They were distributed across different stages of secondary education: 71 individuals (32.7 percent) were in year 1, 77 individuals (35.7 percent) in year 2, and 68 individuals (31.6 percent) in year 3 at Doi Mae Salong and Mae Chan Junior High School.

In terms of their disaster experience, 43.3 percent (65 respondents) had experienced flooding, 21.3 percent (32 students) had dealt with landslides, 23.3 percent (35 students) had faced a drought, and 12 percent (43 students) had experienced earthquakes. The responses from the respondents showed that flooding was the most common disaster, experienced, followed by drought, landslides, and earthquakes. As noted earlier, flooding, drought, and landslides are significant occurrences in Chiang Rai, with the earthquake being a distinct but less frequent disaster, especially in comparison to Japan's context (Nasaku, 2017; Songlar et al., 2018).

Table 1

General Social-Demographic Information of Respondents

General Information	Frequency, n=150	Percentage (%)
Gender		
Girls	78	52%
Boys	72	48%
Age (Years)		
13 -14	96	64%
14 -15	54	36%
Year of Education		
Secondary year 1	49	32.7%
Secondary year 2	54	35.7%
Secondary year 3	47	31.6 %
Disaster Experiences		
Flood	65	43.4%
Landslide	32	21.3%
Drought	35	23.3%
Earthquake	18	12%

In terms of knowledge, among six questions, the highest mean score of 4.08 was attributed to question number one, which addressed basic information about Chiang Rai's geographical

vulnerability to floods, landslides, earthquakes, and drought. Also, the lowest mean score of 3.42 was recorded for question number six, which pertained to the understanding of disaster risk. Questions from number 2 to number 5 also received high mean scores. Consequently, the knowledge of disaster among schoolchildren in the mountainous region of Chiang Rai is assessed to be at a high level, as illustrated in Table 2.

Table 2

Knowledge of Disaster in General among the Schoolchildren in the Mountainous Region of Chiang Rai

Category	Mean (\bar{x})	Standard Deviation	Level of Ability
1. Schoolchildren understand that Chiang Rai has experienced disasters; such as floods, landslides, earthquakes, and drought	4.08	0.70	High
2. Schoolchildren know that disaster happens in both natural and human-made	4.03	0.71	High
3. Schoolchildren know that disaster can be predicted	3.83	0.78	High
4. Schoolchildren know the steps of a disaster emergency drill	3.67	0.85	High
5. Schoolchildren can identify the do's and don'ts during the disaster emergency drills	4.04	0.84	High
6. Schoolchildren understand the risk of disaster	3.43	0.79	Medium
Total	3.85	0.78	High

Furthermore, in terms of the attitude towards disaster, the highest mean score of 3.54 was associated with question 7, which inquired about schoolchildren's eagerness to participate in disaster training. Conversely, a medium mean score of 3.34 was recorded for question number 3, which assessed their lack of nervousness if a disaster were to occur. In contrast, questions 1,2,4,5 and 6 yielded low scores, culminating in a total attitude mean score of 2.63, categorized as a medium level. Comprehensive statistical details are outlined in Table 3.

Table 3*Attitude toward Disaster among the School Children in the Mountainous Region of Chiang Rai*

Category	Mean (\bar{x})	Standard Deviation	Level of Ability
1. Schoolchildren wait for the early warning system before evacuation	2.36	0.74	Low
2. When an early warning system is disseminated, schoolchildren are responsive to evacuate themselves over others	2.39	0.71	Low
3. When a disaster occurs, schoolchildren are not nervous	3.34	0.77	Medium
4. Schoolchildren are more than ready and empowered after training given	2.28	0.83	Low
5. Schoolchildren learn disaster more at home	2.36	0.87	Low
6. Schoolchildren understand the disaster preparedness step, such as emergency bag	2.14	0.74	Low
7. Schoolchildren feel enthusiastic about joining the disaster training	3.54	0.79	High
Total	2.63	0.77	Medium

This situation is strengthened by a key informant that:

- (1) “The integration of the early warning system has not yet been widely used. As a result, this occurrence has significantly shaped students' mindset, as they lack a comprehensive understanding of how to effectively respond to seismic situations.”

Furthermore, within the category of disaster practice, question five, which pertains to evacuating to a safer location during a disaster, garnered the highest mean score of 3.56. Conversely, the remaining five questions attained low scores, resulting in an overall low level of disaster practice among schoolchildren at 2.49. Detailed information encompassing mean scores, standard deviations, and proficiency levels is presented in Table 4 below.

Table 4*The practice of Disaster among the School Children in the Mountainous Region of Chiang Rai*

Category	Mean (\bar{x})	Standard Deviation	Level of Ability
1. Schoolchildren initiate telling family members about disaster emergency drills given by school	2.14	0.72	Low
2. Schoolchildren follow the steps of disaster emergency drill	2.36	0.76	Low
3. During a disaster, schoolchildren avoid dangerous places and stuff	2.54	0.78	Low
4. Schoolchildren check each other with family members after the evacuation	2.14	0.81	Low
5. Schoolchildren run to safer places, and when disaster happens	3.56	0.81	High
6. Schoolchildren have practiced disaster emergency drills at home	2.20	0.80	Low
Total	2.49	0.78	Low

The key informants from both schools mentioned that:

- (2) “Due to the comparatively infrequent occurrence of earthquake disasters, the execution of disaster drills remains inadequate.” Nonetheless, the increased prevalence of earthquakes in this area has instilled greater concern, leading us to emphasize the need for more rigorous disaster drill practices.”

Continuously, the KAP survey data were subjected to analysis concerning schoolchildren's social-demographic factors to comprehend the influential variables in the model, with significance considered at $p < 0.05$. The detailed findings are presented in Table 5.

Table 5

Relationship between the Schoolchildren's Social-Demographic and KAP Survey

Variables	Knowledge		Attitude		Practice	
	F-Test	Sig	F-Test	Sig	F-Test	Sig
Social-Demographic						
Gender	.410	.523	.577	.018	3.286	.072
Age	.266	.607	.125	.724	6.605	.011
Year	.558	.456	1.962	.163	6.269	.013
Disaster Experience	1.610	.206	5.498	.021	6.529	.012

Note: *Significant at $p < 0.05$

Table 5 provides an analysis of the three paradigms - knowledge, attitude, and practice - in relation to social-demographic variables. The knowledge paradigm results in an F-test value of 0.410 with a corresponding *p-value* of 0.532 for the gender variable, 0.266 with $p=0.607$ for age, 0.558 with $p=0.456$ for the school year, and 1.610 with a *p-value* of 0.206 for disaster experience. All of these *p-values* are greater than 0.05 (0.532; 0.607; 0.456; 0.206 > 0.05), indicating that there is no significant relationship between these social-demographic variables and the knowledge paradigm. Consequently, the social-demographic characteristics of children in the mountainous area show no connection to knowledge. Furthermore, the results indicate that the disaster knowledge developed among schoolchildren positively correlates with the disaster education provided by the educational institution, as depicted by the high-level category in Table 2. Indeed, disaster education is introduced in Thailand starting from the sixth grade of elementary school (MoE, 2008), ensuring that secondary students possess a functional understanding of disasters.

Furthermore, the F-test was employed to analyze the attitude variable. Two factors, namely, social-demographic gender with a *p-value* of 0.577 and disaster experience with a *p-value* of 5.498, exhibited *p-value* of 0.018 and 0.021, respectively, both lower than $p=0.05$ (0.018; 0.021 < 0.05). Other F-tests, such as age (0.125) and year (1.962) with *p-value* of 0.724 and 0.163, respectively,

surpass the threshold of $p=0.05$ (0.724 ; $0.163 > 0.05$). Hence, it follows that gender and disaster experience significantly influence attitude, whereas age and year do not exert such an impact.

Despite their moderate level of attitude shown in Table 3, their gender and disaster experience have contributed to a positive attitude, particularly in relation to their engagement in disaster training and their sense of “calmness” during a catastrophe. Indeed, as highlighted by the key informant, female students exhibit enthusiasm and creativity, while also showing a tendency to support and guide their peers and younger counterparts during disaster training.

In practice, four variables with F-test values lower than $p=0.05$: age, year, and disaster experience. The age F-test yielded a result of 6.605 for age with a p -value of 0.0116.269 for year with a p -value of 0.013, and 6.529 for disaster experience with a p -value of 0.012 (0.011 ; 0.013 ; $0.012 < 0.05$). In contrast, the gender F-test yielded a result of 3.286 with a p -value of 0.072, exceeding $p=0.05$. Age, year, and disaster experience are significantly associated with practice, whereas gender lacks a significant connection. Both genders are capable of participating in disaster evacuation exercises led by trainers, despite the contradiction in their influence on attitude. Students excel in executing evacuation drills, particularly when instructors employ scenario-based disaster practices, as mentioned by one of the key informants.

- (3) “No apparent gender-related concerns exist regarding academic success. Both male and female students exhibit adept performance in disaster training.”

Referring to Table 4, practice emerges as the least developed among the three knowledge and attitude paradigms. The key informant noted that students had undergone disaster training, specifically focusing on mitigation strategies for earthquakes, landslides, forest fires, and flooding. The schools have made efforts to conduct a disaster drill at least once a year. However, preparing for catastrophes, especially earthquakes that are rare occurrences, poses practical challenges.

Paradigm Shift in Disaster Education: Re-considering Type of Disaster and Actor-Network Perspective

Furthermore, all five key informants noted that students appear resilient in the face of floods, landslides, and forest fires, seemingly becoming accustomed to such events. Additionally, their parents' ethnic minority background could contribute to their safety, as they inherit local knowledge regarding weather forecasting. As a result, students are better equipped for evacuations in the case of three common disasters compared to earthquakes, necessitating suitable emergency

drills. In contrast, the key informants highlighted that preparation for droughts had been overlooked.

Drought poses a significant challenge in Chiang Rai's highland region. For four months of the year, water becomes scarce, particularly in the Doi Mae Salong area. The existing water tanks are inadequate to store sufficient water. As a result, the school's restroom facilities cannot be used effectively, forcing students to leave for their homes during classes. Amid the drought, ensuring access to safe drinking water and sanitation has emerged as a critical concern. Both instructors and students are unable to access clean water and sanitation facilities, with the most significant impact being on female students who are menstruating, as well as on teachers and students residing in the school dormitory. As a result, the key informants identified water supply management and water crises as critical challenges in disaster preparedness. One of the key informants elaborated:

- (4) “The most notable challenge at school revolves around securing clean water and reliable water supply. Moreover, this situation impacts the teaching and learning activities. This year we have encountered the longest-lasting drought of over four months, surpassing previous year. Therefore, students and teachers must prepare to deal with the drought season. Since there is not so much water available, students sometimes need to go to the toilet, but they will not use the school toilet. They will return home, and some students do not return to school.”

Furthermore, higher education could play a substantial role in facilitating recovery following such a devastating event. One of the key informants stated:

- (5) “The current combination of formal and informal disaster education initiatives has effectively prepared students in terms of their comprehension of evacuation and mitigation strategies. Their awareness has notably improved due to the school's training program offered as an extracurricular activity through the Boy Scout. However, what stands out to me is the necessity for disaster education to transcend mere evacuation drills. It must delve deeper into addressing other crises like drought or climate change. In this regard, I believe the involvement of higher education professionals capable of innovating in this domain is crucial, especially given the school's limited collaboration with universities.”

After conducting a comprehensive examination of key informants, the significance of higher education becomes evident in bolstering capacity and preparation for disasters, notably drought. Latour's actor-network theory reinforces the pivotal role of higher education in disaster management, even though research pertaining to higher education's involvement remains limited. Higher education imparts research-driven knowledge to the public, including school administrators, teachers, and students. At the minimum, higher education collaborates closely with

the government, which can provide backing for disaster preparedness facilities and equipment. As articulated by one of the key informants:

- (6) “Higher education plays a pivotal role, especially in knowledge production. While the universities are responsible for cultivating prominent graduates, it is equally essential to share our discoveries and innovations with society for its advancement. Innovations emerge from the research conducted within the university. Through collaborations with other stakeholders, such as the government, we can receive support to address societal requirements, including disaster scenarios. Currently, we are engaged in creating a disaster program encompassing evacuation drills. Furthermore, we are beginning to shift our attention towards addressing climate change issues.”

Two important informants from Japanese and Thai universities highlighted that the presence of higher education consistently empowers the public with research-derived knowledge, specifically scientifically accurate knowledge. Furthermore, higher education institutions have maintained a strong relationship with the government. Nonetheless, both universities prioritize disaster education for both general public and students by conducting emergency evacuation drills. They emphasized that evacuation exercises serve as the first step toward disaster risk reduction, even disaster evacuation drills are often emphasized in the aftermath of rapid-onset catastrophes like earthquakes, flash floods, and landslides. Although, there's a need for the university to redirect its attention to different forms of disasters, such as climate change and drought.

Knowledge production is shaped by the causalities and capacities of human beings, underscoring accountability and ethical considerations that underscore collective responsibility, particularly within higher education (Terec-vlad, 2016). This knowledge holds crucial importance in steering actions to expedite development (Glock, 2011). For instance, the training provided and generated by stakeholders has notably impacted the schoolchildren's preparedness. Knowledge fosters the ability and understanding of causality, enabling them to draw lessons from the past and effectively prepare for present and future circumstances (Haugberg-Lund, 2016). The spatial dimension further shapes diverse knowledge production. For instance, Japan and Thailand exhibit distinct approaches to diverse knowledge production. Japan, due to its higher occurrence of rapid-onset disasters, has cultivated disaster education specific to this type of calamity.

In contrast, by leveraging technology, Japan has the potential to contribute innovative solutions and advanced technology in the realm of water quality and sanitation. As a recommendation, the knowledge generated and delivered by higher education must immediately transition from addressing rapid-onset catastrophes to addressing gradual-onset catastrophes—a paradigm shift

akin to Thomas Kuhn's concept in the context of disaster knowledge. Thomas Kuhn stated that shifting paradigms brings scientists closer to truth, as mentioned in his 1962 book "The Structure of Scientific Revolutions." Within the scientific community or among positivists, this shift is characterized by progressiveness, accumulation, objectivity, and a linear trajectory extending from the past to present and future consensus (Kalman, 2016; Thomas & Suleiman, 2019). Thomas and Suleiman (2019) elaborated on how human society has encountered diverse events and phenomena necessitating rapid paradigm shifts. Consequently, the pressing need for a paradigm shift in knowledge production within higher education can have a beneficial impact on translating into practical action for disaster education at the school level.

In alignment with the established university networks, as elucidated by Shaw et al. (2011), the collaboration between Thai and Japanese universities emerges as a crucial endeavor in mitigating disaster risks. Given that higher education institutions serve as hubs for innovation, they facilitate the provision of quality education wherein knowledge is deemed accurate and reliable (Tarman, 2016). Hence, incorporating the pivotal role of higher education in disaster management and acknowledging the potency of knowledge as an independent entity proves crucial for fostering disaster resilience and attaining sustainable development goals. Prior research in Thailand has predominantly focused on exploring the knowledge, attitudes, and practices (KAP) of the elderly population, as exemplified by the work of Songlar et al. (2018). In contrast, the present study distinctly concentrates on disaster education for children, recognizing them as a vulnerable demographic group (Tatebe & Mutch, 2015). This study underscores that the role of higher education surpasses information generation, encompassing a heightened involvement in activities and research to bolster the community's capacities, particularly among school-aged children.

Hence, this study holds the potential to enhance comprehensive community resilience, particularly in Northern Thailand. It offers two distinct contributions to the field. Firstly, it highlights the importance of involving stakeholders in advocating for decentralization in school management, especially concerning extracurricular and lifelong learning. Such engagement can assume a pivotal role in school-based disaster management and fostering resilient community development (Wang, 2016). Moreover, a shift has been observed in the generation of disaster knowledge, transitioning from rapid-onset scenarios to slow-onset contexts, with a specific emphasis on drought and flood events. This shift acknowledges the significance of human security concerns and the influence of

anthropogenic climate change. This holds significance within the Anthropocene Epoch, marked by profound human impact on the environment (Dominey-Howes, 2018).

Consequently, it is crucial for all stakeholders, particularly to actively involve local communities in promoting disaster preparedness. This involvement of the local community can enhance knowledge production by enabling the sharing of their everyday experiences and knowledge, with the goal of facilitating experiential and practical learning (Schmitz et al., 2010; Tarman & Dev, 2018). Schools, local government entities, higher education institutions, and the local community all hold pivotal roles in fostering community resilience.

Conclusion and Implication

This research unveiled the significance of higher education in the manifestation of disaster education. Drawing from Bruno Latour's Actor-Network Theory (ANT), higher education serves as a human actant in generating disaster preparedness knowledge, which in turn acts as a non-human actant to strengthen community disaster resilience. Therefore, higher education and knowledge stand as equally crucial entities. However, the prevailing approach to disaster education production in higher education remains centered on rapid-onset disasters.

A paradigm shift in the information generated and imparted by higher education is recommended to address gradual-onset disasters, such as drought and their cascading impacts on clean water, supply water management, and sanitation. Both Japanese and Thai universities bear the responsibility of disseminating scientific knowledge to the general public and community. Through the AUNDM platform, university collaboration, particularly involving Japan and Thailand, holds the potential to generate context-specific knowledge for fostering community resilience in the face of climate change. The existing disaster education in schools predominantly focuses on rapid-onset disasters for schoolchildren in Northern Thailand. This highlights the school's achievement in fostering disaster awareness, even though such disasters have occurred less frequently than in Japan.

Based on the KAP study, schoolchildren exhibit the highest level of knowledge concerning disasters, followed by a medium level of attitude and a low level of practice. The socioeconomic status of schoolchildren shows no apparent impact on or relationship with knowledge. Gender and catastrophe experience have considerably impacted attitudes toward disasters. Female students,

particularly those who have encountered disasters, exhibit a favorable attitude toward disaster training and expressed a desire to be “unwavering” whenever disasters strike.

Moreover, age, year of schooling, and disaster experience substantially affect disaster practice, reflecting Thailand's occasional calamities, notably earthquakes. As a result, the preparedness for rapid-onset disasters is satisfactory, prompting a shift towards a focus on slow-onset disasters. This study has concentrated on the context of Northern Thailand, bearing certain limitations in representing disaster education across the entirety of Thailand. Hence, it is crucial to acknowledge the necessity for further studies in various regions of Thailand, given that the country, for instance, experienced a Tsunami in its southern area in 2004.

This study suggests that to enhance knowledge-sharing initiatives and heighten awareness, particularly within higher education and community engagement, it is highly recommended to strengthen networking and collaboration among stakeholders. Given that slow-onset situations characterize long-term and gradual disasters in the Anthropocene era, emphasizing this shifting paradigm becomes crucial. Furthermore, this research could serve as an initial step toward promoting school-based disaster management in Thailand, carrying practical implications for the integration of disaster education.

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