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A FRAMEWORK FOR SIMULATIONS AND GAMES BASED ON INDIGENOUS KNOWLEDGE AND FOLKLORE TO CREATE DISASTER AWARENESS: COMPARING FROM INDONESIA AND IMPLEMENTING IT IN JAPAN

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ABSTRACT

Indigenous disaster knowledge and folklore play a crucial role in fostering disaster awareness, yet traditional practices are increasingly being neglected in modern society. Simulation and Gaming (S&G) offers a promising solution to these challenges, particularly in raising unconscious understanding of evacuation procedures during earthquakes and tsunamis, especially for those in vulnerable regions. Despite its potential, no scientific research has yet applied this method in Japan. This study analyses the S&G approach used in Indonesia, inspired by the *Smong* folklore, which aims to increase awareness of tsunami risks. Building on this, the research proposes a framework for an S&G tailored to Japan, incorporating *Namazu* folklore and the ancient wisdom of tsunami *tendenko*. The framework was developed through interviews with key informants, including a game maker from Indonesia, a scholar, and a museum manager in Japan. The initial phase of the framework was created to develop a board game for raising disaster awareness among residence along the Tohoku coastline area. The integration of local folklore which is deeply rooted in local culture and making it more relatable and engaging for community members, offers its effectiveness in enhancing community resilience to tsunamis. The study concludes that this innovative approach will not only work in Japan but could also be adapted by other disaster-prone regions worldwide, offering a versatile tool for improving disaster preparedness and safeguarding vulnerable communities.

Keywords: *Simulation and game; Indigenous knowledge; Disaster folklore; Disaster Awareness.*

INTRODUCTION

Natural disasters repeat and are likely to accelerate and become even bigger than before (Oliver-Smith, 1996). **Table 1** illustrates the number of reported earthquakes and tsunami events in the Tohoku Region of Japan and Aceh Province of Indonesia from 1961 to 2011. It has been established through documented evidence that the frequency of earthquakes is increasing. While these figures are contingent upon seismic activity, it is evident that our societies

bear some responsibility for the lack of preparation for vulnerable communities. The conditions above result in a considerable degree of suffering for members of society. To illustrate, the 1907 earthquake and tsunami were categorized as megathrust events and occurred again 97 years later in 2004 (Kongko et al., 2018). The cycle of megathrust is a recurring phenomenon that occurs approximately every 100 years (Hashima & Sato, 2017).

Table 1. History of Earthquake and Tsunami in Tohoku Region, Japan and Aceh Province, Indonesia

Place	Date	Disaster Name	Earthquake Scale	Number of Victims
Tohoku Region	Jul, 13, 869	869 Jogan	M 8,3	1,000
	Dec, 2, 1611	1611 Keicho Oshu	M 8,1	3,500
	Jun, 15, 1896	1896 Meiji Sanriku	M 8,2	22,000
	Mar, 3, 1933	1933 Showa Sanriku	M 8,1	3,000
	May, 22, 1960	1960 Chilean	Mw 9,5	142
	Mar, 11, 2011	Great East Japan	Mw 9,0	22,252
Aceh Province	1907	Earthquake and tsunami	Mw 7.6	400
	2004	Indian Ocean	Mw 9.1	160,000

Source: Iwate Tsunami Memorial Museum taken by Author (2024)

In the wake of the megathrust earthquake that struck in 1907, the *Smong* narrative has become a central position within the social fabric of Simeulue Islanders (Sakurai & Munadi, 2018), transmitted through various social interactions. The transmission of this narrative across generations ensured that the Simeuluean population was effectively alerted to the 2004 Indian Ocean tsunami. Notwithstanding the island's surrounding by the sea, the tsunami resulted in a mortality rate of only seven deaths among a population of 78,000 (in the year 2000) (Kelman, et al, 2008). Past research found that *Smong* as indigenous knowledge is effectively used nowadays for disaster risk education (Baumwoll & Baumwoll, 2008), and disaster preparedness (Dekens, 2014). The *Smong* story was transmitted around Simeuleu islanders through traditional oral such as *'Buai-buai'* (a traditional song), a poem of *Nandong*, and daily conversation in a family or community (Gadeng et al., 2018) and *Nafi-nafi* (a Simeuluean traditional storytelling about events that happened in the past) (Sakurai & Munadi, 2018). The time when *Nafi-nafi* talks the story about story of a Simeuluean ancestor or important events

that happened is after the children finish reciting the Quran (Sakurai & Munadi, 2018). However, Syafwina (2014) argued that *Smong's* alarm would have been forgotten by the next generation due to the ascendance of mass media, including television, radio, film, and the internet, which collectively captured the attention and time of communities and families. Consequently, the ritual practices of *buai-buai* and *nafi-nafi* were nearly abandoned. Furthermore, the Aceh Tsunami Memorial Museum is committed to ensuring the continued transmission of indigenous knowledge, such as that related to the *Smong*, to future generations. This is achieved through engaging activities for young learners, as exemplified by the "*Smong* Box" event. To guarantee the sustainability of indigenous knowledge in the context of disaster awareness, it is advised that a strategic integration of local knowledge with modern technology be implemented (Syafwina, 2014). This combination will enhance the effectiveness and relevance of traditional practices, rendering them more accessible and practical for contemporary use in disaster preparedness and resilience efforts. A recently developed board game, entitled "*Smong*", has been created by Manikmaya Games, a startup company based in Bandung City, West Java, Indonesia. The S&G with a board-based approach could be utilized by pupils and the older generation alike.

Furthermore, the Tohoku Region, particularly the Sanriku Area (situated within the boundaries of Iwate and Miyagi Prefecture) in Japan, had previously been regarded as "the most advanced area in the world in terms of tsunami countermeasures" before the occurrence of the 2011 Great East Japan Earthquake and Tsunami (GEJET). A variety of disaster prevention facilities have been developed, including seawalls, bay entrance seawalls, estuary floodgates, and other infrastructure. Furthermore, the region has witnessed the formulation of substantial tsunami disaster prevention strategies, accompanied by the regular implementation of evacuation drills and disaster prevention education sessions (Tanaka, 2023).

However, an analysis of the 2011 GEJET disaster reveals that the 'hard' disaster prevention measures were ineffective in preventing the loss of nearly 22,252 lives in the Tohoku Region . Takabatake, et al (2017) argue

that protecting coastal populations and relying solely on structural mitigation, facing a Level 2 tsunami, is difficult. The Japanese Coastal Engineering Community posits that a level 2 tsunami has a recurrence period of hundreds or thousands of years, with a tsunami wave height exceeding 10 meters, potentially reaching 20-30 meters. Previous research has confirmed that the 2011 GEJET tsunami was of level 2 severity. The waves reached a height of 30 meters in some areas (Martini & Buda, 2019). To survive a disaster like this, evacuation is therefore the most effective method of saving lives in a disaster of this nature, particularly in vulnerable households.

Remarkably, almost all of the 2,900 elementary and junior high school students managed to survive this catastrophe due to the right time evacuation (Kodama, 2015). The media attributed this extraordinary outcome not to mere chance but to a disaster preparedness program initiated in 2005 (UNDRR, 2015). One of the extensively taught aspects of this program was the concept of "tsunami-*tendenko*," which emphasized the crucial rule of action: "Flee to higher ground for your safety, without waiting for others or even your own family when a tsunami strikes", the term "*tendenko*" is a regional expression meaning "separate and escape" (Kodama, 2015). The effective evacuation of the Iwate Kamaishi school students led to the widespread dissemination of the story of the "Kamaishi Miracle," which acknowledged and commended the tsunami-*tendenko* approach (Katada & Kanai, 2016). The success story of a family that adopted tsunami-*tendenko* compared to the other evacuation concepts, was also exhibited in the Iwate Tsunami Memorial Museum. It is therefore evident that there is a necessity for the tsunami *tendenko* concept to be conveyed in a more efficacious manner, to facilitate comprehension amongst children and ensure its prompt recall in the event of a disaster.

In contrast, researchers have been striving to mitigate the adverse effects of natural disasters by integrating disaster awareness into the context of complex systems, yet, S&G represents the most efficacious approach to cultivating community resilience (see also Toyoda, 2020). However, as Toyoda (2020) observed, the majority of S&G address earthquakes (4 games), followed by floods (1 game). Meanwhile in Indonesia, past research observed S&G

of earthquake (Sudarmilah & Surakarta, 2022) and Flood (Ulya & Akbar, 2023). There is a potential for S&G to make a greater contribution to disaster awareness. Nevertheless, none of the simulation games developed within this field have incorporated disaster folklore as an inspirational narrative.

Against this background, this paper presents an analysis of the prototype of the Smong S&G with the board-based game from Indonesia, which draws inspiration from local folklore to enhance awareness of the risks associated with tsunamis. Furthermore, a brief examination of the Japanese disaster folklore was also conducted. Subsequently, the paper puts forth a theoretical framework for S&G with folklore-based disaster awareness, focusing on earthquakes and tsunamis. Finally, the framework has been created and implemented in a new, developing game simulation based on folklore and Indigenous knowledge, utilizing resources from Japan.

Simulation Game Definition

There is no universally accepted definition of game science (S&G). The concept is presented in different ways by various authors. Klabbers (2018) proposes a framework comprising three levels: philosophy of science, science, and application. The philosophy of science level examines the genesis of knowledge in S&G. The science level concentrates on research methodologies. The application level addresses practical issues in the real world. This study seeks to construct an S&G framework based on indigenous knowledge, particularly folklore, at the philosophy of science level. In addition, Klabbers (2009) put forth three fundamental elements for S&G: actors, rules, and resources (see **Table 2**).

Table 2. Generic Structure of S&G

Generic Structure	Operational Definition
Actor / Player	Players are individuals or groups who participate in the game.
Rule	Guidelines that govern how the game is played.
Resources	Anything that players can use within the game to achieve objectives. These can include physical assets such as cards, game boards, tokens, and the main character from the game.

Source: adapted from Klabbers, (2019) and (Toyoda, 2020)

Given that the S&G are regarded as disaster education tools, participants in the game are typically individuals who have the opportunity to deliberate on their management strategies, gain insight into the evacuation process, and ultimately contribute to community awareness of the most lethal disasters, such as tsunamis. Following the findings of Mayer (2009), S&G can be defined as experimental, rule-based, and interactive environments. In these environments, players learn by taking actions and experiencing the effects of those actions through feedback mechanisms that are deliberately built into and around the S&G. S&G situates players within the context of decision-making as it pertains to other roles. Inevitably, players will always perceive the situation from a personal perspective. However, role-play enables them to gain familiarity with the challenges associated with different designated roles. In S&G, players are allowed to experience both favorable and unfavorable outcomes, thereby facilitating the acquisition of knowledge and insight.

Furthermore, S&G is not merely a training program through which players can develop their skills with the instructions of specialists. Rather, it is an opportunity for players to consider how they would act in situations of uncertainty and to learn how to approach and think about problems. S&G has the potential to serve as a conduit for the transfer and integration of three domains of learning: scientific, experiential, and local. This occurs within the context of the game world, where components of the real world are simplified for players, while focal points are retained. This allows players to deliberate and make decisions based on different roles. S&G represent social systems and are interrelated to the social network around them (J. H. Klabbers, 2018). Concurrently, participants engage with the S&G through the utilization of their own experiential and local knowledge. It is therefore hypothesized that incorporating local knowledge into an S&G will enhance the capacity of vulnerable communities in the region to recognize the impact of past disasters and to take action to mitigate the risk of similar events occurring in the future. Further research is required, but this is beyond the scope of the present study.

Finally, the combination of simulation elements, which are available resources in the S&G, is a tool for interacting with other players or roles to facilitate an

appropriate evacuation process. In this process, the S&G can facilitate an understanding of the importance of collective actions amongst the players.

MATERIALS AND METHODS

This study employs a qualitative research methodology, utilizing semi-structured interviews as the primary data collection instrument. Based on Coughlan, (2016), A semi-structured interview is a flexible research method that allows for a more open-ended approach to data collection. In this research, the author devised a series of questions to ascertain the topic. However, to accommodate any unanticipated responses, the author employed a combination of key-person interviews and open-ended questions until the requisite information was obtained (Coughlan, 2016, p. 310).

The interviews conducted both via Zoom and in person, were carried out to gather insights from six informants carefully selected for their diverse expertise relevant to the research. The informants from Manikmaya Game Publisher (designer - Informant 1, and the conceptor - Informant 2) were chosen for this research as key personnel who were responsible for producing the *Smong* Board Game until the prototype stage. Scholars from Tohoku University in Japan (the expertise of geography researchers - Informant 3 and anthropology researchers - Informant 4) were chosen to provide insights into Japanese disaster folklore, such as *Namazu*. Additionally, personnel from the Iwate Tsunami Memorial Museum (tour guide - Informant 5 and the museum manager - Informant 6) were chosen to provide insights into the concept of "tsunami *tendenko*".

RESULTS AND DISCUSSION

Indigenous Knowledge in Japan: Tsunami Tendenko

Based on the interview, the Author gathered deep information about Tsunami *Tendenko*, where the concept of *"Tendenko"* said as;

> *"Indigenous idiom that means each person is on their own. Along the Sanriku coast in Iwate prefecture, there is the teaching that "when there is a tsunami, each person is on their own. When a tsunami comes, think only of yourself and escape separately. Do not concern yourselves with others around you. This saying was handed down from parents to children, and subsequently to grandchildren. This is a teaching that was born from repeated tragedies in which many people*

> *lost their lives in a tsunami, and is based on a strong sense of protecting lives. (Informant 5)*

"Tendenko" signifies an "every person for themselves" mentality, emphasizing the urgency of swift tsunami evacuation without pausing for anyone, including one's family members (Oe & Kawakami, 2021). This term has been transmitted across generations in the Tohoku region as a crucial directive for action within local communities susceptible to tsunamis. This is because a rapid evacuation to higher ground, without consideration for others, has been identified as the sole means of avoiding the complete devastation caused by a destructive tsunami.

Furthermore, to be adequately prepared for a potential disaster, individuals must undertake the necessary research to gain an understanding of the relevant mitigation strategies. This will enable them to make informed decisions in the event of an actual disaster (Informant 6). The tsunami *tendenko* concept comprises three key elements: where to learn, what to learn, and what to share (informant 5). In terms of where to learn, informant (6) posited that the memorial museum and storyteller (*katarib*e) represent a valuable resource for acquiring knowledge about past disasters. *Kataribe* is a well-known traditional Japanese storyteller, typically an individual who has experienced a disaster and subsequently shared their experiences and survival strategies with subsequent generations (Fulco, 2017). In the meantime, the memorial museum has become a well-known instrument for transmitting memories across generations, to prevent the recurrence of similar tragedies (Gerster & Maly, 2022; Lin et al., 2018). In addition, the term "what to learn" encompasses educational programmes that include disaster mitigation, which comprises crisis management and disaster psychology, disaster responsibility, and survival. The lesson learned from the 2011 GEJET disaster highlighted the importance of disaster psychology. Many individuals delayed evacuation because they had "vague definitions of the situation," which prevented them from making appropriate decisions (Tanaka, 2023). Lastly, what to share was the possibility of improvements in disaster knowledge and disaster prevention technology. As a result of these factors, communities at risk of tsunami disasters have developed a persistent awareness of the need for disaster prevention measures. In line with the objective of indigenous

knowledge-based S&G, namely the enhancement of disaster awareness, the most crucial action is the evacuation to elevated terrain, such as hills. In particular, this study seeks to illustrate that the concept of *tendenko* encompasses a multitude of meanings and functions. These can be distilled into a single, simplified game simulation that is accessible to students at the elementary and secondary levels.

Disaster Folklore in Indonesia: Smong

Based on the interview, the Author gathered deep information about disaster folklore in Japan and Indonesia. *Smong* is well-known by many researchers (Gadeng et al., 2018; Mcadoo et al., 2006; Sakurai & Munadi, 2018; Syafwina, 2014) after the Indian Ocean Earthquake hit Aceh Province, Indonesia, on December 26, 2004. The earthquake and tsunami killed approximately 230,000 people in 14 Indian Ocean countries (Gadeng et al., 2018), while Indonesia was the hardest-hit region, with 167,000 people killed when huge waves struck both the Aceh Province and the island of Nias on the northern edge of Sumatra (Hannis et al., 2019).

In 2018, a board game publishing company in Indonesia released a "*Smong*" board game. This board game prototype was demonstrated at the world's largest convention for gaming at Messe Essen, Germany, on October 25 – 28, 2018 (Informant 1,2). A concise depiction of the prototype elucidates the concept that "*Smong"* a local term signifying "tsunami," is a representation of such an event. In this prototype, *Smong* is initially conceived as a dragon, a figure prominent in the local folklore (informant 1). In response to the question, the respondent provided a detailed account of the historical context and inspiration behind the *Smong* games. They explained that the idea originated from a poem written by the *Smong*, which articulated a particular narrative;

> *Anga Linon ne Mali (if the earthquake is strong), Uwek suruik sahuli (followed by the lowering sea), maheya miwahali (go and find in a hurry), fano me singa tenggi (a higher place for your safety), ede Smong kahanne (for that is the one we call "Smong"(Informant 1).*

As previously stated, the *Smong* folklore is as follows:

> *One day, the beautiful sea turtle island of Simeuleu, was shocked by an earthquake. The rumbling of the earth itself was terrifying enough, but a bigger threat was coming*

from the sea. Smong, the giant dragon of the sea is coming towards the island bringing along gigantic waves and destruction with it. Fear grasped the whole island; how would the small turtles stand against such force? And so, more and more turtles fell victim to the vicious dragon. The King of Turtles, in his desperation, went searching for help from Sultan Alam, ruler of Andalas. The Sultan gathered all his admirals, generals, and aides, but none of them have the courage nor the capability to subdue Smong. Their ships and soldiers are no match for it. Suddenly, a prince from Barus went forward and said "Your Majesty, there is one person that we believe might be able to defeat Smong. In our area, there is a boy known as Nabang, The Whale Rider. However, we know not where to find him for he never stayed in one place, but always moved around the ocean leaving the sound of his flute song as the only trail". "Very well," said the Sultan, "I shall consult this with my friend, The Eagle Lord, and hopefully, with his help we can find The Whale Rider". The next day, The Eagle Lord found Nabang and brought him back to meet Sultan Alam. Listening to the story of the turtles, Nabang agreed to help the island, even though he didn't believe he would be able to defeat Smong. A great battle occurred, Nabang riding his whale friend fought fiercely against Smong. After a long battle, Smong unleashed a devastating attack, throwing Nabang away, and drowning the whale unconscious. Seeing the suffering of his whale friend, Nabang took his flute and played a sad song. Unexpectedly, the sad song struck Smong with an unknown calmness. Nabang realized this was his opportunity to subdue the dragon. He keeps playing the song until Smong fell asleep. Once his whale friend regained consciousness, Nabang, with the help from the turtles pushed Smong to the bottom of the sea and caged it among the rocks. Sultan Alam heard about the event, and feel so happy and relieved that Nabang had succeeded in defeating Smong. He invited Nabang back to the palace. In the palace, after all the celebrations, Nabang announces a warning to all the people of Andalas:

"Smong might be asleep now, but we shall never forget its threat. Smong is now regaining his power, and once it collected enough, the earth will be shaken by its struggle to release itself. It will drain water from the sea and unleashed it back onto the beaches and shores with a destructive power. So be warned, let all the people of Andalas remember this, when a strong earthquake occurred, followed by the lowering of the sea, run to the hill, and find a higher place for your safety, for it is Smong who is causing it" (Informant 1,2).

Following the account mentioned above, the S&G is tasked with ascending the hillside in anticipation of the impending seismic event and the subsequent arrival of the smoke. Once the *Smong* had begun to descend, the mission was to direct it toward the ocean's depths. A detailed account of

the principal outcome can be found in Table 3.

Disaster Folklore in Japan: Namazu

In Japanese mythology, *Namazu* is depicted as a giant catfish that lives beneath the Japanese islands. It is believed that *Namazu's* movements are the cause of earthquakes. The god Kashima is responsible for restraining Namazu with a large stone, ensuring Japan's earthquake safety. However, if *Kashima* is careless, *Namazu* will thrash around and cause devastating earthquakes (Informant 3) (see **Figure 1**).

Figure 1. Catfish prints from 1855. On the left, the Kashima deity uses a foundation stone to pin down an earthquake catfish. On the right, he uses a bottle gourd, similar to the one used in *Otsu e*.
Source: (Noburu & Mamoru, 1995)

The story begins before the 1855 Ansei Edo Earthquake, a fisherman named, Shinozaki, noticed that catfish, normally lake bottom dwellers, were swimming near the surface (Smits, 2012). After that, the earthquake transpired, prompting the fisherman to perceive it as a portent of an imminent earthquake occurrence. The giant catfish became an increasingly popular symbol of earthquakes during the nineteenth century, and the profusion of catfish prints was the most dramatic manifestation of that symbolism.

The well-known Japanese myth of a giant underground catfish, *Namazu*, said to reside beneath the island of Chikubushima in Lake Biwa, Shiga Prefecture, northeast of Kyoto, and whose movement is believed to cause earthquakes, was frequently documented in woodcut prints produced following

the Ansei Edo (Tokyo) earthquake of 1855 (Basher & Ono, 2022). However, Smits (2012) argues that the notion of a correlation between catfish and earthquakes did not gain widespread acceptance until the 17th century. This notion emerged from pre-existing, albeit unrelated, religious and cosmological concepts. Furthermore, the explicit myth depicted in woodcut prints only became popular following the 1855 event. The poem, which deals with the earthquake and catfish that were discovered in 1678, was written by Matsuo Bashō. It reads as follows (Smits, 2012):

寂滅の貝ふき立る初嵐
The early storm, blaring its conch-shell horn of destruction
石こづめなる山本の雲
The cloud at the base of the mountain raining down stones
大地震つづいて竜やのぼるらん
The great earthquake continues, and the dragon rise
長十丈の鯰なりけり
It was a *namažu* ten jõ in length

Simulation Game Board of Smong from Indonesia

The *Smong* board game, which draws inspiration from local myths about earthquakes and tsunamis, represents a novel approach to disseminating knowledge about disaster awareness to the general public. The players, game's rules, and available resources (see **Table 3**) were based on the results of interviews with respondents (informants 1 and 2). The S&G, which is based on *Smong* folklore, has been developed to enhance tsunami disaster awareness. The game invites players to assume the role of residents who must respond to a tsunami disaster in a precise and strategic manner (Informant 1).

Discussion

In the decade following the 2004 Indian Ocean (Sumatra) tsunami, a series of catastrophic events occurred, including the 2006 Java, 2009 Samoa, 2010 Chile, and 2010 Mentawai tsunamis, each of which resulted in hundreds of fatalities (Rabinovich & Eblé, 2015). A poignant exemplification of a sequence of calamitous occurrences was the Tohoku (Great East Japan) tsunami that occurred on 11 March 2011, which resulted in the loss of nearly 20,000 lives and the destruction of the Fukushima Daiichi nuclear power plant (Gerster & Maly, 2022). It seems reasonable to posit that the number of victims would have been significantly higher in the absence of existing tsunami mitigation programs. These programs have been instrumental in raising awareness about the dangers of tsunamis, teaching important skills, and

helping to improve preparedness for such emergencies, with a particular focus on people in vulnerable areas.

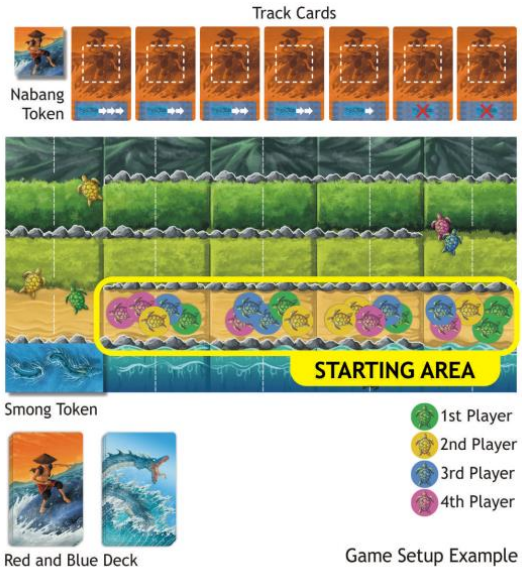
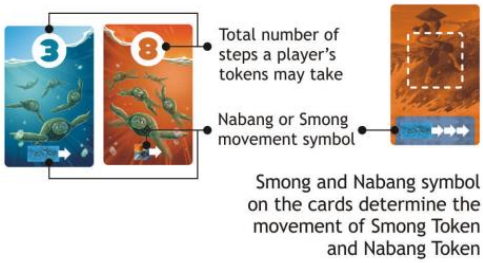
A comparative analysis of the *Smong* and *Namazu* narratives reveals several similarities. Both poems serve to exemplify the formidable power and destructive potential of natural phenomena, particularly earthquakes and tsunamis. In the Japanese poem, the tremors are personified as "dragons" that is "catfish," effectively ascribing divine or giant-like characteristics to the forces of nature. In the Indonesian poem, the entity *Smong* is identified as the cause of earthquakes, thereby combining mythology with a natural phenomenon.

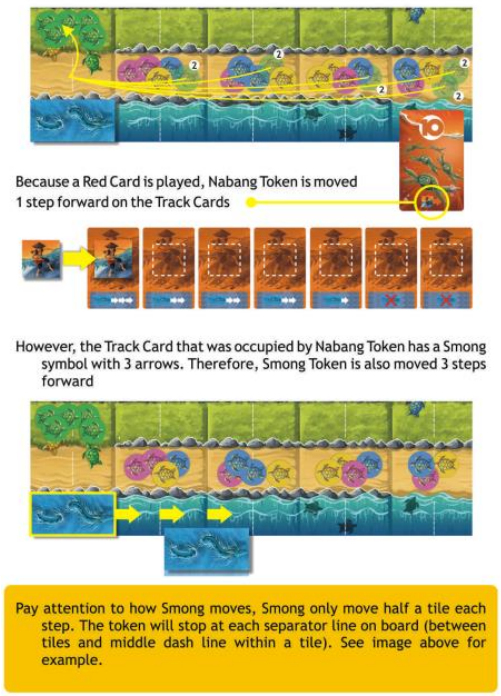
Additionally, *Smong* is personified as a dragon, although no specific dragon is identified, in contrast to the Japanese narrative. Both poems place significant emphasis on the importance of seeking refuge in a secure location during an earthquake. In Japan, the entity "*Namazu*" is identified as the cause of earthquakes, with the belief that these occur due to the movements. In Indonesia, *Smong* is also identified as the cause of earthquakes and the subsequent generation of tsunamis. It should be noted, however, that there may be regional variations in the legends surrounding its specific appearance and nature.

The following framework presents a comparative analysis of two distinct cultural myths, *Namazu* from Japanese folklore and *Smong* from Indonesian folklore, as foundational concepts for the development of an early-stage disaster awareness simulation game. Both myths are related to natural disasters, specifically earthquakes, and tsunamis, and have been adapted into game simulations to educate the public and promote disaster preparedness. The framework delineates the fundamental components of each game, including players, rules, resources, and objectives, to demonstrate how local folklore can be employed to impart vital survival techniques and to heighten community awareness of disaster risks.

The following section presents a comprehensive comparison of the simulation game elements derived from the *Namazu* and *Smong* myths. Based on the result, the framework of S&G based on local indigenous such as folklore is formulated in **Table 4**.

Table 3. The Result of this Research Understanding the Structure Games of *Smong* Inspired by the Folklore

Structure of games	Picture	Answer Description
Players		In this game, the players consist of up to four individuals represented by the colors green, yellow, blue, and purple. These players take on the role of residents who need to respond to a tsunami disaster. The diagram's starting area represents the players' initial positions, which turtles symbolize. The player layer is divided into five levels, where tokens begin in the first row: ocean area, beach area, plain area, forest area, and mountain area at the top. This image is the initial setup to start the game. The action in-game setup must first shuffle blue and red cards and make facedown decks for both kinds of cards. Randomly decide on the first player. For the setup, this game will use the starting squares which are the 1st of 4th squares of beach/sand area (starting from the right). Players choose a color, take the turtle tokens, and place them on board following this order: -The 1st player put 2 tokens in the first square of the sand area, and 1 token in the 2nd, 3rd, and 4th squares. -The 2nd player (going clockwise from the first player) put 2 tokens in the 2nd square and 1 token in the other square. - The 3rd player and 4th player put 2 tokens in the 3rd and 4th squares respectively, and 1 token in all the other squares. Shuffle all 10 Track Cards, take out 3 of them, and put them back in the box. Put the rest of the (7) cards to form a line on the top side of the board. Put *Nabang* token on the left side of the first card.
Rules		**HOW TO PLAY** The game is divided into 2 phases. At the start of the game, is an "Escape Phase". In this phase, players have to save as many turtles as possible (especially their own color) while waiting for *Nabang* to arrive (represented by the Track Cards). **1. ESCAPE PHASE** 1. During the turn, a player takes 1 card from the Red Deck and 1 card from the Blue Deck. The player then has

Structure of games	Picture	Answer Description
The movement of the game		to decide which card he/she want to use in this turn to move their turtle tokens on the board. 2. Player use the chosen card and move his/her tokens accordingly and discard it to the discard pile. Player keeps the other card (the one that wasn't used) in his/her hand. 3. The number shown on the card is the total number of steps that players' token may take (shared among all the tokens) 4. If a player chooses/play a Red Card, move the *Nabang* Token 1 step forward to the right (moving into the Track Card). If a player uses a Blue Card, move the *Smong* Token 1 step forward on the board. 5. Pay attention to Track Cards, if *Smong* symbol(s) is on the card, the player also have to move *Smong* Token according to the number of arrows shown. **MOVEMENT RULES** 1. Players may move their tokens each turn, based on the card they choose to play. The number on the card they played decides the total number of steps all the tokens may take. 2. Each square/tile can only be used by 5 turtle tokens. If there are already 5 tokens on a tile, the player skips that tile and moves forward to the next available tile. 3. If a player uses a Red Card, the *Nabang* Token is moved 1 step towards the board (going left on the Track Cards). The number of arrows on Track Cards then may trigger *Smong* movement. 4. If a player uses a Blue Card, the *Smong* Token is moved 1 step forward. Pay attention to the *Smong* movement rule (see example). *Smong* only moves half a tile on every step (stops at the white dash line). 5. If during a player's turn, any Turtle Tokens are taken over by *Smong* (*Smong* reaches a tile with turtle tokens in it), the active player takes those turtle tokens and keeps them. It will be counted as a penalty at the end of the game (-1 Point for each token)

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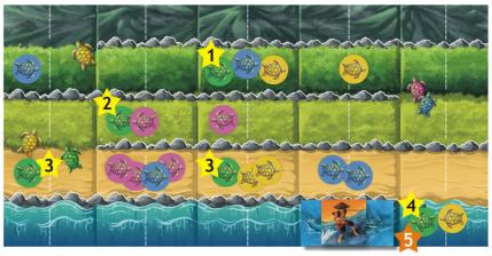
Structure of games	Picture	Answer Description
	Player with the highest total score wins the game.  Scoring Example: For Player 1 (Green) the total score for Turtle Tokens position are 1 Token in 2nd row = 1 Point 1 Token in 3rd row = 2 Points 2 Tokens in 4th row = 3 x 2 = 6 Points 1 Token in 5th row = 4 Points Bonus for 1 Token positioned closest to Smong = 5 Points Total Point = 1 + 2 + 6 + 4 + 5 = 18 Points	**ENDING PHASE** The game enters the ENDING PHASE when *Nabang* Token reaches the board (enters the board from the right-most Track Card). Put *Nabang* Token on top of *Smong* Token and start ENDING PHASE. 1. Players count the number of cards in hand. All players must have the same number of cards. If there are players with fewer cards, they must take additional cards by choosing either from the Red or Blue Deck (until they have the same number of cards as all the other players) 2. Players then use their cards in hand to move their Turtle Tokens back to the ocean, helping Nabang to push the now asleep *Smong*. 3. On their turn, players may move the Turtle Token using the same rule as in the Escape Phase (the number on the card total steps of all the tokens). 4. When a token reaches a square where the *Smong* token is, the *Smong* token is pushed backward to the next tile (*Smong* no longer moves half a tile now, but one tile each step backward). 5. The game ends when all players' cards have been used. **END GAME & SCORING** Players get Victory Points according to their token's position on the board, as follows: tokens in first row/mountain area get 0 points, tokens in 2nd row/forest area get 1 points, tokens in 3rd row/plain area get 2 points, tokens in 4th row/beach area get 3 points, and tokens in 5th row/ocean area get 4 points. All tokens that are placed nearest to the *Smong* token also get a bonus of 5 points. Don't forget to count the minus point from Turtle Tokens that was taken over by *Smong*, for the player responsible for it.

Table 4. S&G Framework of *Smong* and *Namazu* as the Early-Stage Development for the Disaster Awareness S&G based on Local Indigenous

Game Simulation Items	*Namazu*	*Smong*
Player	The S&G can be played with four players, who can be start from pupils at a junior high school until an adult resident in an area vulnerable to tsunamis. Such areas may be coastal or have a history of tsunami activity.	The S&G can be played with four players, who can be start from pupils at a junior high school until an adult resident in an area vulnerable to tsunamis. Such areas may be coastal or have a history of tsunami activity.
Rules	Japanese myth, *Namazu* 鯰, is the cause of earthquakes and tsunamis. By moving his tail, he can shake the entire earth. The God, who has to look after it, sometimes gets tired or distracted, and *Namazu* can move a bit and cause an earthquake. Tsunami Tendenko = Flee to higher ground for your safety, without waiting for others or even your own family when a tsunami strikes." (The term "tendenko" is a regional expression meaning "separate and escape.") (Kodama, 2015). - 1st round = Answer the question to collect powerful capstone related to the right evacuation. - 2nd round = Help God calm the *Namazu* END GAME AND SCORING	*Smong*, the giant dragon of the sea, is coming to the island and bringing along the gigantic waves. Fear grasped the island, and the King of Turtle sought help from Sultan Alam, ruler of Andalas. A Boy called Nabang, the whale rider, can defeat *Smong*. A great battle occurred; after almost losing the battle, Nabang took his flute and played a sad song. The *Smong* fell asleep, pushed to the sea's bottom, and caged it. *Smong* might be asleep now but never forget it. 1st round = Escape Phase = Save turtle as many as you can - 2nd round = Ending Phase = Help Nabang pushing *Smong* Back END GAME AND SCORING
Resources	- Namazu = giant catfish for earthquake and tsunami reason - God Kashima = a figure who can be controlled with the help of a powerful capstone - Resident Characters (e.g., families or villagers) = These symbols can represent people the players must save in a disaster scenario caused by Namazu. - The board game	- Dragon = Smong / Tsunami - Nabang = the whale rider is the only people can defeat Smong - Turtle = Players - The board game

CONCLUSIONS

This study illustrates the potential of employing local indigenous knowledge and folklore to develop efficacious simulation games (S&G) for disaster awareness. By comparing the *Smong* folklore from Indonesia with the *Namazu* myth from Japan, the research demonstrates how these cultural narratives can be adapted into engaging and educational tools that promote community resilience against tsunamis. The proposed framework offers a

distinctive approach to integrating traditional wisdom with contemporary game design, thereby creating a meaningful learning experience that enhances disaster preparedness. The findings indicate that incorporating local folklore into S&G can significantly contribute to raising disaster awareness, particularly in vulnerable regions, and can be adapted for various contexts worldwide. This innovative method bridges the gap between traditional knowledge and contemporary disaster management practices, offering a versatile tool to safeguard communities and reduce disaster risk effectively. The study acknowledges several limitations, including its reliance on qualitative interviews, which may limit generalizability, and the cultural specificity of the *Smong* and *Namazu* frameworks, which might require adaptation for use in other cultural contexts. Additionally, as the game is still in the prototype stage, further testing is necessary to validate its long-term impact on disaster awareness. Future research is encouraged to explore digital adaptations of the game to enhance accessibility and evaluate its effectiveness over time.

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