FROM ANCIENT NARRATIVES TO DIGITAL STORYBOOK: HCI PERSPECTIVES ON USING HIKAYAT GEMPA FOR DISASTER EDUCATION

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ABSTRAK

Terletak di wilayah yang sangat kompleks, yaitu di zona konvergensi tiga lempeng tektonik utama di dunia; Lempeng Indo-Australia, Lempeng Eurasia, dan Lempeng Pasifik, Indonesia memiliki tingkat kerentanan bencana yang sangat tinggi. Oleh karena itu, Indonesia perlu menerapkan berbagai strategi untuk meningkatkan kesiapsiagaan bencana masyarakatnya, salah satunya melalui peningkatan literasi bencana sejak usia dini. Studi ini meneliti kebangkitan kembali Hikayat Gempa Sjeh Rih Kruengraja sebagai cerita penting untuk pendidikan bencana modern, dengan fokus pada Interaksi Manusia-Komputer (HCI). Untuk menghubungkan pembelajaran digital dengan warisan tak benda, proyek ini menciptakan kerangka desain untuk buku cerita bencana. Studi ini menggunakan pendekatan kualitatif yang menggabungkan analisis teks naratif cerita rakyat historis dengan Diskusi Kelompok Fokus (FGD) yang melibatkan sejarawan budaya, spesialis bencana, dan perancang interaksi. Dengan mengubah warisan leluhur menjadi buku cerita digital, temuan studi ini menunjukkan pentingnya memasukkan warisan tak benda ke dalam pendidikan bencana. Hal ini membuat pendidikan menjadi lebih menarik, beresonansi secara emosional, dan relevan bagi generasi digital saat ini.

Kata kunci: pendidikan kebencanaan, hikayat gempa, hci, buku cerita digital

ABSTRACT

Located in a very complex region, namely in the convergence zone of three major tectonic plates in the world; the Indo-Australian Plate, the Eurasian Plate, and the Pacific Plate, Indonesia has a very high level of disaster vulnerability. Situated in a highly complex region, at the convergence zone of three major tectonic plates: the Indo-Australian Plate, the Eurasian Plate, and the Pacific Plate, Indonesia has a very

high level of disaster vulnerability. Therefore, Indonesia needs to implement various strategies to improve its community's disaster preparedness, one of which is through increasing disaster literacy from an early age. This study looks at the revival of the Hikayat Gempa Sjeh Rih Kruengraja as an important story for modern disaster education, focusing on Human-Computer Interaction (HCI). To connect digital learning with intangible heritage, the project creates a design framework for a disaster storybook. The study used a qualitative approach that combines narrative text analysis of historical folklore with Focus Group Discussions (FGDs) involving cultural historians, disaster specialists, and interaction designers. By turning ancestral heritage into a digital storybook, the findings of this study show the importance of incorporating intangible heritage into disaster education. This makes education more engaging, emotionally resonant, and relevant for today's digital generation.

***Keywords**: disaster education, earthquake story, hci, digital storybook*

INTRODUCTION

Indonesia is in a very complex region, at the convergence zone of three major tectonic plates in the world: the Indo-Australian Plate, the Eurasian Plate, and the Pacific Plate. These geological conditions place Indonesia in the category of countries with a very high level of vulnerability to natural disasters, especially earthquakes and tsunamis (Verstappen, 2010). Statistical data shows that the intensity of disasters in Indonesia has been significantly increasing; in 2020 alone, there have been at least 8624 recorded cases of earthquakes, not including various other natural disaster phenomena such as volcanic eruptions, flash floods, and landslides (Wally et al., 2023). Unfortunately, the high frequency of disasters is directly proportional to the number of casualties, deaths, and the extent of infrastructure damage. This tragic phenomenon highlights a sharp imbalance between the real threat of disasters and the level of understanding and preparedness of the community in facing them.

Over the past few decades, the government and various non-governmental organizations have been striving to enhance resilience thru various mitigation programs, ranging from the installation of early warning systems to periodic disaster simulations (Kamal et al., 2023; Suharto et al., n.d.). Nevertheless,

numeorus previous studies have indicated the concerning fact that the efficacy of these traditional mitigation programs tends to be low and often fails to create sustainable awareness at the grassroots level. One of the contributing factors is the top-down and technocratic nature of the mitigation approach, which oftent disregards local knowledge, including wisdom and other type of intangible cultural heritage, rednering foreign and challenging for local communities to comprehend as it does not touch upon their emotional or cultural aspects (Imperiale & Vanclay, 2020; Saputra et al., 2025). In fact, involving local knowledge will actually contribute to the long-term recovery process after a disaster (Bahmani et al., 2025).

Amid the stagnation of modern mitigation effectiveness, history records that traditional communities in disaster-prone areas have possessed extraordinary self-defense mechanisms thru cultural heritage. Local wisdom spread throughout the archipelago, whether in the form of folktales, poems, or legends, contains crucial disaster information. The most well-known example is the Smong narrative from Simeulue Island, which has proven successful in diving into cultural sensitivityThe most well-known example is the Smong narrative from Simeulue Island, which has proven successful in saving thousands of lives during the 2004 Indian Ocean Tsunami (Hasan Sari & Husin, n.d.; Rahman et al., 2017). This local knowledge is not merely a myth, but rather a record of past empirical data passed down thru oral tradition as life safety instructions. However, it is very unfortunate that this rich intellectual heritage is now on the brink of extinction. The dominance of highly standardized modern education curricula tends to overlook local cultural values, causing younger generations to gradually lose connection with their ancestral wisdom. Studies show that a holistic approach applied in education plays a crucial role in disaster risk reduction, which is also in line with what is stated in the Hyogo Framework for Action, emphasizing knowledge, innovation, and education to enhance safety and resilience culture while strengthening disaster preparedness for effective response at all levels (UNISDR, 2005).

Intangible cultural heritage should be repositioned as the main guide in the implementation of contextual disaster education. In oral traditions, the narratives depicted in folk tales or epics serve as a medium for the transmission of knowledge between generations, passed down through the ages. (Syahputra, 2019). The

integration of traditional narratives into educational media is not just about the transfer of information, but also about emotional resonance (Kosim et al., 2024). The storyline, characters, and local historical background that are closely tied to the daily lives of the local community make it more easily accepted compared to formal instructional procedures. This is where the field of Human-Computer Interaction (HCI) plays a strategic role in bridging the gap between tradition and technology. HCI offers perspectives on how a technological system should be designed to align with the needs, behaviors, and cognition of its human users (Panda, 2024; Sinha et al., 2010). In this context, HCI serves as a bridge that transforms static ancient texts into dynamic digital experiences for the digital native generation.

The use of computer science concepts, particularly through interactive design, allows intangible heritage like the Hikayat Gempa to speak again in a frequency understood by today's children. The main challenge is not the process of digitizing the text of the Hikayat Gempa, but rather how to design an interaction that can maintain cultural authenticity while ensuring navigation and the interface remains user-friendly for young users. The transformation of oral narratives into digital storybooks requires a deep understanding of HCI elements such as emotional design, usability, and user engagement. (Yao, 2024)

The *Hikayat gempa Sjeh Rih Kruengraja* is a manuscript containing direct information about the disaster that occurred in 1964 and was felt in several areas of Aceh (Hiroki & Watanave, n.d.). This hikayat is divided into several location sessions, both coastal and inland in the Aceh Besar region, allowing readers to visualize the earthquake conditions in those areas. Using this tale as the basis for developing disaster media adds value in terms of novelty, especially given the very limited research related to this intangible heritage.

Thru a multidisciplinary approach involving the philological analysis of ancient narratives and Focus Group Discussions (FGDs) with selected experts whose expertise aligns with the research theme, this study aims to formulate a conceptual framework for the development of interactive digital storybooks. The main focus of this research lies in how the thematic analysis results from the perspectives of cultural experts, linguists, disaster practitioners, and educators can be translated into concrete HCI design parameters. This study does not stop at design technicalities,

but rather strives to provide strategic guidelines that synergize pedagogical aspects with cultural sensitivity.

This research is expected to demonstrate that by incorporating ancestral wisdom into modern technology, we can create a new disaster education ecosystem. The hope is that future generations will not only become individuals skilled in using digital technology but also culturally resilient individuals with high resilience in facing disasters. In the end, this innovation is a crucial step to ensure that the warning voices from the past will never again be lost to time but will remain alive and save lives in the future thru the medium of smart digital technology.

METHOD

This study uses an exploratory design and qualitative methodology. To fully understand the role and significance of Hikayat Gempa (The Earthquake Tale) as an intangible cultural heritage in the context of disaster education, and to investigate how the narrative can be translated into a digital design framework based on the Human-Computer Interaction (HCI) perspective, this approach was chosen over quantitative hypothesis testing (Maculewicz & Osz, 2022) (Preutenborbeck et al., 2024). The narrative is positioned in this study as a source of cultural knowledge, and potential approaches to transforming it into an interactive digital storybook are identified using HCI as a conceptual lens.

The choice of this exploratory qualitative design is based on the need to delve into the depth of instructional meaning implied in the poetic structure of *Hikayat Gempa*. Considering that the original manuscript of Sjeh Rih Kruengraja uses the complex old spelling of the Acehnese language, this methodology allows researchers to conduct a deep textual deconstruction before formulating it into design parameters. The data collection process was conducted thru Focus Group Discussions (FGD) involving a multidisciplinary panel of experts, including philologists, disaster mitigation practitioners, child psychologists, and interaction designers.

This participatory approach ensures that every design recommendation produced is not only technical but also has a strong pedagogical foundation and cultural sensitivity. Thru the lens of HCI, this research identifies user requirements

that bridge the cognitive gap between past generations and digital native generations. Thus, this study positions technology not as a replacement for tradition, but as a dynamic preservation medium that allows ancestral mitigation values to remain functional and relevant in the contemporary digital ecosystem. Thus, this study positions technology not as a replacement for tradition, but as a dynamic preservation medium that allows ancestral mitigation values to remain functional and relevant in the contemporary digital ecosystem.

Data Collection Method Focus group discussions (FGD) are used to collect primary data. FGD was chosen because it allows for targeted discussions among participants with various backgrounds relevant to the research subject. Additionally, thru the FGD, more information will be obtained due to the cross-information among participants. The participants in the FGD include linguists, manuscript experts, children's literacy advocates, disaster management experts from local government organizations, and academics with backgrounds in education and disaster management. The FGD participants were selected based on their knowledge of Aceh's disaster history, traditional *hikayat* customs, and children's literacy activism.

There are three main topics became the focus of the conversation:

a. The purpose and advantages of *Hikayat Gempa* as an intangible cultural resource.
b. The significance of the *hikayat* in the context of Aceh's disaster history.
c. Opportunities to transform the *Hikayat* Gempa into a disaster education medium in digital format.

DISCUSSION

This research explores folklore and intangible heritage and their relevance to modern life within the parameters of children's storybook design. The data obtained from the FGD has been transformed into verbatim transcripts and processed to produce thematic analysis. In addition to the topics listed previously, information related to other intangible heritage in Aceh, not only related to natural disasters, is also mentioned, for example the *Prang Sabi* story which tells about the war conditions in Aceh, or other local wisdom which is narrated implicitly in the *Tarek Pukat* dance. In addition to the topics listed above, information related to

other intangible heritage in Aceh, not just natural disasters, is also mentioned. For example, the *Hikayat* Prang Sabi, which tells the story of the war in Aceh, or other local wisdom implicitly narrated in the Tarek Pukat dance. However, only discussions related to the *Hikayat* Sjeh Rih Krueng Raja will be discussed in this research.

There are four main pillars that form the conclusions of this research, as follows:

1. The tale of the earthquake and the challenge of local cultural transformation

The tale of the earthquake by Sjeh Rih Kruengraja is not in the form of a rhymed narrative like most tales, but rather in the form of a live report that explains the geographical conditions of various regions in Aceh at the time the earthquake occurred in 1964. The concept offered in this *hikayat* is essentially in line with the live concept on social media today, where users provide live reports of an event and share information from their perspective with the general public. In addition, this *hikayat* also uses the old spelling of the Acehnese language, making it a challenge not only in understanding but also in how to reintroduce it as a culture rich in knowledge and information.

In reintroducing this earthquake tale, a format that aligns with the habits of the younger generation, with a digital concept, is necessary. The end users of the media must also be considered, so that even tho the format used is in line with the times, it will not be effective if the users are not involved as a consideration in the media's development. Then, the use of bilingualism becomes one of the important solutions, so that this media not only introduces disaster management values but also how Acehnese terms are recognized again. The use of Gen Z terms as replacements will be another attraction. In the FGD, several terms that have been used to describe tsunamis were mentioned, not only as large floods but also as iebeuna. In another narrative, the tsunami is referred to as an octopus monster, to describe the ferocity of the large waves.

In the context of HCI, the differences in language and spelling found in the original manuscript of the earthquake tale can lead to the emergence of a cognitive gap, necessitating contemporary adaptation. The use of bilingualism, summarizing the main points closely related to disaster mitigation in each part of the tale,

becomes a solution that bridges the cognitive gap. However, it is important to note that in this process, cultural authenticity must be maintained to prevent any shifts.

2. Cognitive Bridge thru Cultural Scaffolding

In addition to addressing the cognitive gap, adapting narratives from old spelling to contemporary formats is a form of Instructional Scaffolding in educational media (Jumaat & Tasir, 2014). By integrating "Gen Z" diction and a bilingual format, this system is actually re-encoding disaster technical information into the mental schema of young readers. This aligns with the HCI principle regarding the User's Mental Model, where the digital interface must be in harmony with the way users think and communicate in their daily lives. Thus, *Hikayat Gempa* is no longer seen as a foreign entity from the past, but rather as contextual information presented in the format and habits of current users.

3. Relevance and Emotional Design in HCI Perspective

Intangible heritage is an important artifact whose content and context are still very relevant to modern life today. This is reinforced by various previous studies that focus on the application of ancestral heritage in the context of disasters in different regions of the world. For example, the *Hikayat Gempa* Sjeh rih Kruengraja realistically depicts the conditions during the earthquake, but some changes are needed, such as metaphors that represent disaster conditions, like the use of an octopus monster to depict a tsunami. This is considered important as part of the application of emotional design. Additionally, the use of metaphors to describe disasters recorded in the script aims to build situational awareness in children without triggering an excessive fight-or-flight (trauma) response. In the context of HCI, this is done to create an interface that educates without triggering trauma in the reader or anxiety-free education. Thus, this media will be able to have a positive impact on increasing children's awareness of disasters.

4. Visual Metaphors as a Risk Communication Strategy

The use of metaphors such as the octopus monster to represent a tsunami is an innovative risk communication strategy in HCI. Theoretically, literal representations of disasters often lead to information avoidance due to fear.

However, the use of metaphors enables Cognitive Offloading; children can understand the structural mechanisms of disasters through analogies without being burdened by the paralyzing emotional impact. In educational design, this creates a balance between Affective Engineering (Affective Design) and the delivery of scientific facts, ensuring that the mitigation message remains conveyed even when the original visualization is transformed into a more child-friendly format.

5. Parametrization of User Requirements

The user/reader perspective in this research is crucial and requires careful consideration. The format, font, book type, story type, and language must be adapted to the child's background, including their age. The use of interactive features, read-aloud features, or gamification elements will be attractive to readers. The FGD also demonstrated that the successful digitization of local wisdom depends heavily on the balance between preserving the "spirit" of the original Acehnese manuscript and the flexibility of digital interaction. If all these aspects are considered, this storybook will not only present a story rich in disaster knowledge, but also reintroduce cultural values in a contemporary format.

6. Digitization as a Dynamic Preservation Effort

The FGD results emphasized that digitization is not simply transferring text to a screen, but rather a dynamic preservation effort. In the context of Acehnese local wisdom, preserving the "spirit" of the original manuscript while implementing interactive elements (such as gamification and read-aloud) demonstrates that the usability of educational media does not have to sacrifice historical value. The flexibility of digital interaction identified in this study provides an opportunity for the *Hikayat Gempa* to transform from a mere archival document into an active mitigation instrument that adapts to the changing literacy behaviors of the digital generation.

CONCLUSION

This study confirms that Sjeh Rih Krueng Raja's *Hikayat Gempa* is not simply a literary artifact, but a highly relevant disaster mitigation instrument. Its strength lies in its ability to describe in detail the geographical conditions of Aceh at the time

of the disaster. However, for this message from the past to resonate with the digital generation, the process of transforming it into an interactive storybook format requires a sensitive approach to the reader profile. Through this exploratory study, three key parameters were identified for this transformation:

1. Language and Meaning Restoration: Transliterating the manuscript into modern Acehnese spelling, validated by philologists. This step ensures that the scientific meaning behind each verse can be understood without losing its cultural roots.
2. Empathetic Emotional Design: Using visual metaphors to depict the horror of the disaster. The goal is to convey a message of caution to children safely, without arousing trauma (anxiety-free education).
3. Interactivity and Accessibility: Integrating bilingual features and interactive elements to build emotional engagement in readers.

These three parameters embody the principles of Human-Computer Interaction (HCI), which place humans, both experts and end users, at the center of media development. This approach ensures that the resulting educational product is not only historically accurate but also pedagogically effective. Theoretically, this research enriches the fields of Cultural Computing and HCI by demonstrating that local wisdom is dynamic and adaptable through the User-Centered Requirements method. The use of popular visual and linguistic metaphors emphasizes that the key foundation for digitizing emotional ancient texts is the balance between readability and user psychological comfort.

Furthermore, the success of culture-based disaster mitigation in the modern era depends heavily on designers' skill in maintaining the balance between historical authenticity and cognitive ease. As a preliminary study, these findings open the door to developing a disaster education curriculum that is more personalized and relevant to local contexts. Future research is expected to test these parameters through the creation of functional prototypes to measure the extent to which information is absorbed and able to change disaster preparedness behaviors in children. Thus, the Earthquake Story will no longer be merely a static collective memory but instead transform into an adaptive, life-saving instrument for future generations.

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