

Integrasi Metode Edukasi Bencana Jepang dengan Kearifan Lokal pada Kesiapan Mitigasi Bencana Banjir di Surakarta

Integrating Japanese Disaster Education Methods with Local Wisdom Flood Preparedness in Surakarta

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Abstract: Surakarta City has long been recognized as a flood-prone city since the early 1900s—no wonder some districts, such as Sewu and Sumber Districts, are demonstrating strong grassroots flood management initiatives. However, children's participation and interest in disaster preparedness have varying degrees of engagement. To address these issues, this project explores the integration of Japanese disaster education methods- specifically the Iza! Kaeru Caravan and the Kawaii Bunka approach to local flood disaster mitigation strategies. The Iza! Kaeru Caravan offers interactive and playful learning activities on disaster response or play-based learning activities, while Kawaii Bunka, which leverages elements of visual charm, approachability, and emotional appeal to strengthen engagement among children Implemented in 2025-2026 at Sumber and Sewu District. These methods were adapted to local contexts by incorporating indigenous knowledge, cultural practices, and community-led initiatives. The evaluation results showed a clear improvement in children's knowledge after participating in the three educational modules. Snake & Ladder (+19,5); Twister (+6.3) and Emergency Kit Moduler (+7.6). Each of the three interventions shows statistically significant enhancements ($p < 0.001$). The study highlights the potential of cross-cultural adaptation of disaster education approaches to address local needs, ensuring sustainable and inclusive disaster risk reduction in flood-prone urban areas.

Abstrak: Kota Surakarta telah dikenal sebagai kota rawan banjir sejak awal 1900an. Tidak heran beberapa Kecamatan seperti Kecamatan Sewu dan Sumber, menunjukkan inisiatif pengelolaan banjir berbasis masyarakat. Namun, partisipasi dan minat anak-anak dalam kesiapsiagaan bencana menunjukkan tingkat keterlibatan yang bervariasi. Oleh karenanya, proyek pengabdian masyarakat ini bertujuan mengeksplorasi integrasi metode Pendidikan bencana Jepang –

Kata Kunci: Budaya
Kawaii, Mitigasi Bencana
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Khususnya Iza! Kaeru Caravan dan pendekatan Kawaii Bunka ke dalam strategi mitigas bencana banjir lokal. Iza! Kaeru Caravan menawarkan kegiatan pembelajaran interaktif dan menyenangkan seputar tanggal bencana berbasis permainan. Sedangkan, Kawaii Bunkan memancaatkan unsur daya Tarik visual dan daya tarik emosional untuk memperkuat keterlibatan anak-anak. Dilaksanakan pada tahun 2025-2026 di Kelurahan Sumber dan Sewu. Metode ini diadaptasi ke dalam konteks lokal dengan menggabungkan pengetahuan lokal, praktik budaya, dan inisiatif masyarakat. Hasil evaluasi menunjukkan peningkatan yang jelas dalam pengetahuan anak-anak setelah berpartisipasi dalam tiga modul pendidikan: *Snake & Ladder* (+19,5); *Twister* (+6,3); dan *Emergency Kit Modular* (+7,6). Masing-masing dari ketiga intervensi tersebut menunjukkan peningkatan yang signifikan secara statistik ($p < 0,001$). Studi ini menyoroti potensi adaptasi lintas budaya terhadap pendekatan pendidikan bencana untuk memenuhi kebutuhan lokal, sehingga memastikan pengurangan risiko bencana yang berkelanjutan dan inklusif di kawasan perkotaan yang rawan banjir.

1. INTRODUCTION

Surakarta City has a unique urban landscape. At 548 kilometers, the Bengawan Solo River is the biggest river on the island of Java. The city of Surakarta, which has a population exceeding half a million, is where it flows. Reports suggest that the Bengawan Solo River is facing a severe ecological crisis attributed to contamination, silt buildup, and the lack of a sufficient waste management infrastructure. As a result, flooding frequently occurs in Surakarta every year when the river overflows. The risk of flooding is particularly high in densely populated settlements along the riverbanks (Rahayu, 2023).

The flood disasters in this region have continuously affected public health, economic endeavors, and urban infrastructure, rendering flood disaster preparedness an urgent necessity. The case study areas are located in Kampung Sumber, Sub-district of Sumber, District of Banjarsari and Kampung Sewu, Sub-district of Sewu, District of Jebres of Surakarta City, whereas two riverside settlements in Surakarta that are highly exposed to flooding (Figure 1).

Kampung Sumber, located along the banks of the Kali Pepe River, faces problems of high population density, limited drainage systems,

and inadequate infrastructure, all of which exacerbate the risk of flooding. Meanwhile, Kampung Sewu, located near the confluence of the Bengawan Solo and Boro Rivers, is characterized by low-lying floodplains and forms part of the upper reaches of the river system in the city of Solo. These conditions make the community especially vulnerable peoples to recurring inundation and related health risks (Zein & Marfai, 2010).

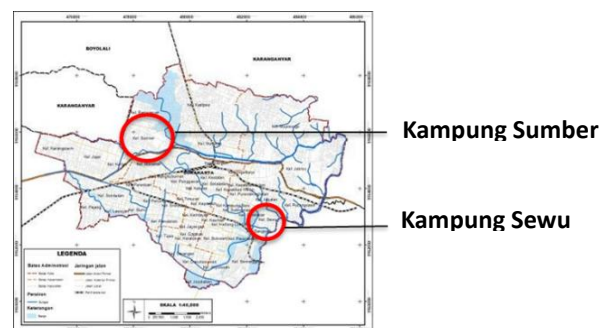


Figure 1. Flood Map of Surakarta City

The limited empirical investigation of integrating play-based disaster education, kawaii-inspired visual engagement, and local knowledge in flood-prone Indonesian communities is the research gap. The potential of culturally adapted Japanese strategies for child-centered flood preparedness has not been properly explored because existing approaches

typically rely on traditional drills or classroom-based education.

Despite these challenges both Kampung Sumber and Kampung Sewu have strong traditions of community organizing through neighborhood associations and River Care Communities (Komunitas Peduli Sungai, or KPS). These social structures provide a foundation for mobilizing disaster preparedness and environmental stewardship, making them appropriate contexts for testing participatory and culturally adapted educational tools.

The city government's slum upgrading program, officially handed over in 2022, has shown the potential to deteriorate into healthy living conditions (Sujatmiko, 2022). This is due to the poor quality of the constructed housing, inadequate infrastructure, and urban community practices that are not yet aligned with principles of sustainability. Considering the urgent issues of water resource conservation and flood disaster risk, community involvement and participation in river stewardship have become increasingly important as anticipatory measures against both droughts and floods.

The theme of this initiative, "Development of Educational Tools for Flood Disaster Mitigation and Healthy Housing," emerged from the challenges faced by local KPS. These community partners have consistently worked on advocacy related to disaster mitigation, sustainable river knowledge, and healthy housing along riverbanks. However, they face significant challenges in optimizing educational content and outreach, particularly in designing creative learning tools that can engage children and youth more effectively.

The main obstacle lies in the limited human resource capacity of KPS members, especially in design and technological knowledge. This limitation hinders their ability to transform valuable field experiences into structured

educational simulation modules on river sustainability and disaster preparedness. Since field experiences embody essential local wisdom, it is important that they be documented and transmitted to younger generations.

This program is therefore not only a medium for documenting local knowledge but also a tool for distributing and revitalizing community-based disaster education. Another challenge concerns the stagnation of regeneration within the KPS. The lack of public interest in KPS activities has limited their ability to implement diverse programs for river conservation and education. It is expected that the development of interactive tools and disaster simulation programs will attract local youth to participate more actively and contribute to field activities, ensuring sustainability of river stewardship.

Children, in particular, represent a crucial demographic in disaster education. They are among the most vulnerable during flood events because of their limited capacity to respond independently, yet they also play an influential role within households and communities. Their participation in preparedness activities not only strengthens their own resilience but also influences the behavior of families and neighbors (Johnson et al., 2021; Peek, 2020). However, in Indonesia, disaster education programs such as *Sekolah Siaga Bencana* remain largely lecture-based and fail to maintain children's long-term interest (Rochman et al., 2018). This calls for more creative, participatory, and culturally resonant approaches. Participatory design techniques, such as community mapping, FGD with users, and collaborative sketching, improves relevance and ownership of design outcomes in kampung settings (Kusumaningdyah, 2018).

Japanese methods such as Iza! Kaeru Caravan and Kawaii Bunka offer promising

alternatives. Iza! Kaeru Caravan, developed in Kobe after the Hanshin–Awaji Earthquake, transforms disaster drills into community-based games and simulations, making preparedness fun and engaging for children and families (World Bank, 2016). Meanwhile, Kawaii Bunka, rooted in Japanese popular culture, emphasizes visual appeal, emotional engagement, and playful aesthetics to sustain children’s attention and foster emotional connection (Nitto et al., 2012; Yano, 2013; Kinsella, 2019). Integrating Iza! Kaeru Caravan with Kawaii Bunka is particularly relevant for disaster education in Surakarta, as both methods complement each other: while Iza! Kaeru Caravan provides structured games and simulations for disaster learning, Kawaii Bunka enhances children’s engagement through aesthetic and affective elements.

Although both methods have been studied in Japan and other contexts, limited research exists on their adaptation to Southeast Asian settings, especially flood-prone communities in Indonesia. Previous approaches in Surakarta have not systematically integrated play-based learning with visual aesthetics and local wisdom, leaving a gap in disaster education practices. This study aims to address this gap by developing and testing educational tools for children in the Sewu and Sumber neighborhoods of Surakarta. Specifically, the research investigates how the integration of Iza! Kaeru Caravan and Kawaii Bunka can increase children’s disaster knowledge, foster engagement, and revitalize community-based river stewardship through culturally adapted learning.

2. METODE

This study used a participatory action research (PAR) design, which emphasizes collaboration between researchers and community members in identifying problems,

designing interventions, and evaluating outcomes through the focus group discussion (FGD) (Figure 2). PAR was chosen because it allows for the integration of local knowledge with external methods, ensuring that educational tools developed are contextually relevant and sustainable.

The research was conducted in two riverbank neighborhoods of Surakarta: Kampung Sewu and Kampung Sumber. These communities were selected due to their high vulnerability to flooding and their active involvement in River Care Communities (KPS).

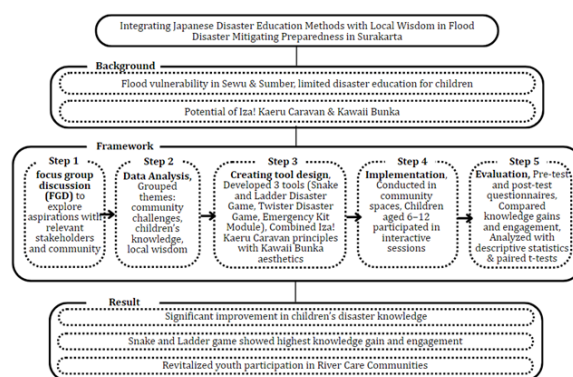


Figure 2. Method Framework

The participants consisted of 65 children between the ages of 6 and 12 years, with 32 from the Sewu neighborhood and 33 from Sumber. The gender distribution was approximately balanced (34 boys and 31 girls). The children were recruited through the local KPS’ community in each kampung with the approval of their parents or guardians. In addition, members of the KPS and local community leaders participated as facilitators and observers during the activities.

The inclusion criteria for participants were:

1. Children living in riverbank settlements within the Sewu or Sumber neighborhoods.
2. Children aged 6–12 years who were able to participate in group-based games.

3. Parental or guardian consent for participation.

2.1 Step 1: Focus Group Discussions (FGDs)

The first stage involved conducting FGD with KPS Sewu and Joglo Bambu Sumber communities. The FGDs were designed to gather insights into local environmental challenges, disaster experiences, and community knowledge of floods. Topics discussed included:

1. Local perceptions of flood risks and their impacts.
2. Children's existing knowledge about river management and disaster preparedness.
3. Local legends, rituals, and cultural practices related to rivers that could be integrated into the educational tools.

The FGDs also identified specific challenges faced by KPS, such as limited human resources, technological barriers, and stagnation in youth regeneration. These insights provided the foundation for designing relevant educational tools.

2.2 Step 2: Data Analysis

The qualitative data from FGDs were analyzed through several stages:

1. Reduction: Identifying key issues and discarding irrelevant information.
2. Categorization: Grouping findings into themes such as community challenges, children's knowledge gaps, and cultural resources.
3. Interpretation: Analyzing the underlying meanings of participants' responses, particularly how local wisdom and environmental awareness could be leveraged in disaster education.

This process allowed researchers to systematically link community insights with the design of the educational interventions.

2.3 Step 3: Tool Design

Based on the findings of the FGDs, three educational tools were designed for children aged 6–12. The tools combined the principles of Iza! Kaeru Caravan (play-based disaster education) with Kawaii Bunka (visual and emotional engagement). The tools included:

1. Snake and Ladder Disaster Game

A modified board game where each square contained questions or instructions related to flood disasters, rivers, and healthy housing. Correct answers allowed players to advance, while incorrect answers required them to move backward, simulating real-world consequences.

2. Twister Disaster Game

A physical game where children responded to prompts about disaster actions (e.g., “duck under a table during an earthquake” or “go to the evacuation point”). The activity combined movement and knowledge to improve both cognitive and physical preparedness.

3. Emergency Kit Module

A hands-on activity where children identified and arranged items that should be included in an emergency kit, such as water, food, flashlights, medicines, and important documents. Visual *kawaii-style* illustrations were used to make the kit appealing and easy to remember.

The design process followed the principles outlined by Park and Lee (2016), ensuring that creativity, collaboration, and both divergent and convergent thinking were encouraged.

2.4 Step 4: Implementation

The implementation phase was conducted over two weeks in community spaces within Sewu and Sumber neighborhoods. Activities were facilitated by trained members of KPS with

support from the research team. The sessions began with an introduction to disaster risks and river stewardship, followed by the interactive games. Children were divided into smaller groups to ensure active participation. Each session lasted approximately 90 minutes, including explanations, gameplay, and debriefing discussions. The facilitators emphasized linking the activities to children's everyday experiences, such as crossing rivers, recognizing signs of flooding, and understanding evacuation routes

2.5 Step 5: Evaluation

Evaluation was carried out using pre-test and post-test questionnaires tailored to each game. The questionnaire used a Likert-scale scoring system, in which each response was assigned a numerical score based on the level of agreement or understanding. The scores were then aggregated to calculate the pre-test and post-test results and measure changes in children's disaster preparedness knowledge

Each questionnaire consisted of five questions assessing knowledge of disaster risks, response actions, and preparedness items. For example, the Snake and Ladder questionnaire included questions about types of disasters and river conservation, while the Emergency Kit module tested children's understanding of survival items.

The evaluation process involved:

1. Administering the pre-test before the activity
2. Conducting the game or simulation
3. Administering the post-test immediately after the activity

The reliability of the questionnaires was confirmed with Cronbach's $\alpha = 0.81$, indicating strong internal consistency. Data analysis included descriptive statistics to measure

average scores and paired t-tests to determine the significance of knowledge gains.

3. LITERATURE REVIEW

3.1 Children's Vulnerability and the Importance of Disaster Education

Children are among the most vulnerable groups in disaster situations. Their limited physical capacity, dependence on adults, and lack of decision-making power make them highly exposed to risks during floods and other natural hazards. At the same time, they have the potential to become key actors in disaster risk reduction when provided with appropriate knowledge and tools (Peek, 2020; UNDRR, 2022). Several studies emphasize that disaster education targeting children contributes not only to their individual preparedness but also to household and community resilience, since children often share their knowledge with family members (Johnson et al., 2021). In Indonesia, disaster education for children has been integrated into school programs such as Sekolah Siaga Bencana under the National Agency for Disaster Management (BNPB). However, these programs are still dominated by conventional lectures and lack creative pedagogical approaches (Rochman et al., 2018). As a result, children's participation tends to be passive, and knowledge retention is limited. This gap underlines the urgency of exploring alternative approaches that are participatory, engaging, and adapted to local cultural contexts.

3.2 Disaster Education in Southeast Asia

Research in Southeast Asia provides evidence that participatory disaster education methods improve children's awareness and response skills. In the Philippines, school-based disaster preparedness programs that integrate simulation drills and interactive modules have

been shown to enhance knowledge retention and foster a culture of preparedness (Domdom, 2019). Similarly, in Thailand, Sukma and Kitamura (2020) reported that combining experiential learning with evacuation drills effectively increased children's awareness and self-efficacy during disasters. Despite these promising examples, studies in Southeast Asia often remain limited to conventional drills or classroom-based methods. Very few incorporate visual aesthetics, play, or cultural creativity into their design. This represents a research and practice gap where cross-cultural adaptations, such as those from Japan, could enrich regional approaches to disaster education.

3.3 Iza! Kaeru Caravan

The Iza! Kaeru Caravan program originated in Kobe, Japan, following the 1995 Hanshin-Awaji Earthquake. It was developed as an innovative way to transform disaster drills into enjoyable, community-centered events (World Bank, 2016). The approach emphasizes hands-on activities, educational games, and simulations that allow children to experience disaster scenarios in a safe and playful environment. For example, children participate in board games like Snakes and Ladders adapted with disaster-related questions, role-play exercises for evacuation, and workshops on emergency preparedness. One of the strengths of Iza! Kaeru Caravan lies in its integration of Design Thinking, where tools are designed iteratively based on community needs. Research by Park and Lee (2016) highlights that child-centered design should focus on creativity, collaboration, and problem-solving skills, which are all key elements of the Iza! Kaeru Caravan method. Its success in Japan has encouraged international organizations, including the World Bank, to

promote it as a model for disaster education worldwide.

3.4 Kawaii Bunka

Kawaii Bunka, or the culture of cuteness, is a significant element of Japanese popular culture that has expanded beyond entertainment into education and design (Yano, 2013; Kinsella, 2019). Nittono et al. (2012) demonstrated that exposure to cute images promotes careful behavior, narrows attentional focus, and increases motivation in learning contexts. These findings suggest that kawaii aesthetics can be strategically used to enhance children's engagement in disaster education, where sustaining attention is often a challenge. The use of kawaii elements, such as colorful visuals, mascots, and playful characters, reduces anxiety associated with learning about disasters and transforms potentially frightening topics into approachable content. Recent studies in Indonesia also confirm the effectiveness of visual and playful approaches in improving learning outcomes. Sulistyaningrum and Widodo (2022) found that illustrated storybooks enhanced elementary students' recall memory, while Oktaviani et al. (2023) showed that animated e-flashcards improved pre-reading skills in early childhood education. These findings align with the kawaii philosophy, where aesthetics and affective engagement become essential drivers of learning.

3.5 Integration of Iza! Kaeru Caravan and Kawaii Bunka

While Iza! Kaeru Caravan and Kawaii Bunka have been studied independently, limited research has examined their integration. Combining them offers a unique pedagogical synergy: Iza! Kaeru Caravan provides structured simulations and games

for disaster learning, while Kawaii Bunka enhances visual appeal and emotional involvement. Together, they have the potential to create educational experiences that are not only informative but also enjoyable and memorable for children. In the context of Surakarta's riverbank communities, this integration is particularly relevant. Local challenges, such as the high risk of floods and the need for youth participation in River Care Communities, require educational tools that can capture children's interest while building practical knowledge. By embedding local wisdom into the design such as river myths, cultural rituals, and community practices, the adaptation of Japanese methods could provide culturally resonant and sustainable disaster education models.

4. RESULTS

4.1 Advocation Tools of Izza Kaeru and application

The development process resulted in three localized advocacy tools adapted from the principles of Iza! Kaeru Caravan and Kawaii Bunka: the Snake and Ladder Disaster Game, the Twister Disaster Game, and the Emergency Kit Module. Each tool was specifically designed to transform disaster preparedness into an engaging, age-appropriate activity for children aged 6–12. The Snake and Ladder Disaster Game introduced key concepts of floods, rivers, and healthy housing through a modified board game, where children advanced by correctly answering disaster-related questions. The Twister Disaster Game combined movement and knowledge, prompting children to perform disaster-related actions such as seeking safe shelter or identifying evacuation points, thus stimulating both cognitive and physical preparedness.

Meanwhile, the Emergency Kit Module provided a hands-on activity where children identified, arranged, and discussed essential items for an emergency kit, enhanced with kawaii-style illustrations to make the activity visually appealing and easy to remember. Together, these tools represented a balance between structured knowledge transfer and playful, emotionally engaging experiences.



Figure 3. (a) Snake and Ladder Design, (b) Emergency Kit Design, (c) Twister Design

The implementation stage was carried out at Joglo Bambu, Kampung Sewu, a well-known community space frequently used for environmental and social activities. This venue allowed children to gather in a familiar setting while interacting with local River Care Communities. Importantly, the program was conducted in collaboration with students from Kokushikan University (Japan) and Rotterdam University of Applied Sciences (Netherlands), who brought intercultural perspectives and creative facilitation methods. Their involvement enriched the learning experience, making the activities more dynamic and enjoyable. The cross-cultural exchange also created an atmosphere of solidarity, showing children that disaster preparedness is a universal concern shared across nations. The combination of playful tools, local context, and international collaboration turned the sessions into not only an educational but also a fun and memorable event, fostering greater enthusiasm among

children to engage in community-based disaster preparedness.



Figure 4. (a) Snake and Ladder Games in Kampung Sumber, (b) Twister Games in Kampung Sumber, (c) Emergency Kit Education in Kampung Sewu

4.2 Knowledge Gains

The evaluation results showed a clear improvement in children's knowledge after participating in the three educational modules. Pre-test and post-test data were collected and analyzed using descriptive statistics and paired t-tests. The results are summarized in Table 1.

Table 1. Pre-test and Post-test Results of Educational Activities

Activity	Pre-Test Mean	Post-Test Mean	Gain	p-value
Snake and Ladder	1.00	20.50	+19.5	<0.001
Twister	13.14	19.42	+6.3	<0.001
Emergency Kit Module	11.57	19.14	+7.6	<0.001

Based on Table 1, the data show that the pre-test mean has a result that Snake and Leader reveals (1.00), the interpretation show that the level of difficulty of the material varies, or that the children's prior understanding of river conservation is indeed very limited. Snake and leader activities seem not very interesting in the pre test.

Meanwhil based on Table 1 pre-test and post-test results indicated that all three educational activities markedly enhanced

children's understanding of flood disaster preparedness following the intervention. The Snake and Ladder Disaster Game showed the most significant enhancement, with the average score rising from 1.00 in the pre-assessment to 20.50 in the post-assessment, indicating a knowledge increase of 19.5 points.

The Twister Disaster Game shown a significant enhancement, as the average score escalated from 13.14 to 19.42, shows an improvement of 6.3 points. The Emergency Kit Module also enhanced participants' understanding, increasing the pre-test average from 11.57 to a post-test average of 19.14, resulting in a 7.6-point improvement. Each of the three interventions shows statistically significant enhancements ($p < 0.001$), suggesting that the noted gains in knowledge were improbable to have arisen by mere coincidence.

These results imply that incorporating the Iza! Kaeru Caravan's utilization of Kawaii Bunka-inspired instructional resources significantly improved children's comprehension of disaster readiness, with the Snake and Ladder game exhibiting the most substantial educational effect among the three modules.

4.3 Children's Engagement and Preferences

Children's participation levels were consistently high across all activities. However, observation and feedback indicated that the Snake and Ladder game was the most popular, with all participants engaging actively and enthusiastically. The simplicity of the rules, combined with its familiar format, made it accessible even for younger children (Table 1).

This finding aligns with Sakurai et al. (2020), who emphasized that child-friendly games enhance motivation and willingness to participate in disaster education. Similarly, Mavilidi et al. (2017) found that combining

physical activity with learning increased satisfaction and knowledge retention among children. In this study, the Twister Disaster Game reinforced these findings by encouraging both physical movement and cognitive recall, though its slightly higher complexity limited immediate engagement compared to Snake and Ladder.

The Emergency Kit Module, while less “playful,” provided the most practical knowledge. Children not only learned about essential items but also engaged in discussions about why each item was important, linking knowledge directly to survival skills. Mubarak (2019) highlights that practical training is among the most effective forms of disaster risk reduction, and this was reflected in the children’s significant post-test improvement.

4.4 Integration of Local Wisdom

One of the distinctive features of this program was its incorporation of local cultural elements into the tools. It shows from Table 2, for example, questions in the Snake and Ladder game were contextualized with references to the Bengawan Solo River and traditional stories such as Nyai Kasur. Similarly, community rituals like grebek apem were included as examples of collective action and resilience. Embedding cultural references enhanced children’s familiarity and relevance, thereby increasing engagement. This resonates with Domdom’s (2019) findings in the Philippines, where integrating local cultural practices into disaster education made programs more effective and sustainable. In Surakarta, the use of local myths and traditions strengthened the sense of ownership among participants and connected modern disaster education with community identity.

Table 2. Knowledge and Implementation through Community Activities

Knowledge	Activities
Knowledge about Rivers and Natural Disasters	Snake and Ladder Game
Disaster Response Action	Twister Game
Essential Items during Disasters	Emergency Kit

4.5 Implications for Community and Youth Engagement

Beyond the immediate knowledge gains, the activities also had implications for broader community engagement. The KPS reported that the activities sparked renewed interest among local youth in participating in river conservation and disaster preparedness. By designing tools that were visually appealing and enjoyable, the program helped overcome the stagnation in regeneration that KPS had previously faced.

This suggests that interactive disaster education can serve not only as a tool for knowledge transfer but also as a strategy for community mobilization. The participatory design process itself acted as a medium for documenting local wisdom and engaging practitioners in translating their experiences into educational tools.

5. CONCLUSION

This study examined the integration of two Japanese disaster education methods, *Iza! Kaeru Caravan* and *Kawaii Bunka* into the context of flood preparedness education for children in riverbank communities of Surakarta. The findings demonstrated that combining participatory advocacy and game-based simulations with visually appealing and emotionally engaging elements significantly improved children’s disaster knowledge and preparedness. The

Snake and Ladder disaster game produced the highest levels of enjoyment and knowledge gain, the Twister disaster game fostered physical engagement while reinforcing preparedness actions, and the Emergency Kit Module provided children with practical survival knowledge. Together, these tools illustrate the effectiveness of interactive and culturally adapted disaster education approaches.

The findings underscore the capacity of interactive educational instruments to stimulate community engagement and rejuvenate youth participation in River Care Communities. By creating enjoyable, relatable, and visually captivating games and simulations, local organizations can garner increased engagement from children and adolescents, thereby securing ongoing river stewardship and disaster readiness. These instruments can be duplicated in additional flood-vulnerable regions, incorporated into educational programs, or embraced by municipal authorities and NGOs as components of comprehensive disaster risk mitigation plans.

Future research should extend the sample to cover different communities with varied socio-economic backgrounds and use longitudinal assessments to evaluate retention and behavioral applications over time. A mixed methods approach such as observations during disaster drills, interviews with families and partnerships with schools, could provide a more holistic insight into children's preparedness. Also, the digital versions of these tools like mobile applications or interactive animations can be explored to improve their reach and sustainability in this digital world. Technology integration in educational systems can increase engagement and ensure that vital information is available to everyone. Such innovations can also foster collaboration among different

stakeholders, thus resulting in more resilient communities in the face of emergencies.

To summarize, this study shows that the use of *Iza! Kaeru Caravan* and *Kawaii Bunka* for flood preparedness education is a new and effective model to involve children in disaster risk reduction. This approach integrates play, esthetics and local wisdom to increase knowledge, while also generating emotional connection and community participation. It also contributes to the overall goal of building resilient riverbank communities in Indonesia.

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REFERENCE

- Domdom, R. (2019). Disaster preparedness education in Philippine schools: Policy and practice. *Asia Pacific Education Review*, 20(3), 421–433. <https://doi.org/10.1007/s12564-019-09578-1>

- Johnson, V. A., Ronan, K. R., & Alisic, E. (2021). Children's disaster education: A systematic review. *International Journal of Disaster Risk Reduction*, 56, 102153. <https://doi.org/10.1016/j.ijdr.2021.102153>
- Kinsella, S. (2019). *Cuties in Japan*. Routledge.
- Mavilidi, M., Okely, A., Chandler, P., & Paas, F. Effects of Integrating Physical Activities Into a Science Lesson on Preschool Children's Learning and Enjoyment. *Applied Cognitive Psychology*, 31, 281-290. <https://doi.org/10.1002/ACP.3325>.
- Mubarak, A., Amiruddin, R., & Gaus, S. (2019). The effectiveness of disaster prevention and mitigation training for the students in disaster prone areas. *IOP Conference Series: Earth and Environmental Science*, 235. <https://doi.org/10.1088/1755-1315/235/1/012055>.
- Nittono, H., Fukushima, M., Yano, A., & Moriya, H. (2012). The power of kawaii: Viewing cute images promotes a careful behavior and narrows attentional focus. *PLoS ONE*, 7(9), e46362
- NPO Art Plus (2017). *Learn While Having Fun : New Kinds of Disaster Drill "Iza! Kaeru Caravan"*. Message From 1995 at Kobe.
- Oktaviani, N., Kurniawati, R., & Sari, D. P. (2023). Animated video-based e-flashcard learning media for early childhood pre-reading abilities. *Journal of Early Childhood Education*, 15(2), 233–244.
- Park, J., & Lee, S. (2016). Childhood Design Education Guidelines for Creativity Development. *Archives of Design Research*, 29, 97-112. <https://doi.org/10.15187/ADR.2016.08.29.3.97>
- Peek, L. (2020). Children and disasters: Understanding vulnerability, developing capacities, and promoting resilience. Springer. <https://doi.org/10.1007/978-3-030-49920-4>
- Prasetyo, K. (2022). Flash Flood Disaster Mitigation Through Environmental Education. *Geomatics and Environmental Engineering*. <https://doi.org/10.7494/geom.2022.16.4.119>
- Rahayu, E. (2023). Flood vulnerability of the Bengawan Solo River in Surakarta. *Geomatics and Environmental Engineering*, 17(2), 45–59. <https://doi.org/10.7494/geom.2023.17.2.45>
- Rochman, C., Yulianti, R., Nasrudin, D., & Malik, A. (2018). Physics concept on flood mitigation in West Java. *IOP Conference Series: Materials Science and Engineering*, 434. <https://doi.org/10.1088/1757-899X/434/1/012015>
- Sakurai, A., Sato, T., & Murayama, Y. (2020). Impact evaluation of a school-based disaster education program in the 2011 Great East Japan Earthquake and Tsunami area. *International Journal of Disaster Risk Reduction*, 47, 101632. <https://doi.org/10.1016/j.ijdr.2020.101632>
- Sujatmiko, T. (2022). Evaluating slum upgrading programs in Surakarta: Challenges in achieving sustainable housing. *Journal of Urban and Regional Studies*, 18(2), 210–225
- Sulistyaningrum, D., & Widodo, H. (2022). The effect of picture stories on recall memory ability of elementary students. *Jurnal Buana Pendidikan*, 18(1), 10–18. <https://doi.org/10.36805/jbp.v18i1.1458>
- Sukma, P., & Kitamura, Y. (2020). Disaster education in Thailand: Lessons learned from school programs. *International Journal of Disaster Risk Science*, 11(2), 123–134.

<https://doi.org/10.1007/s13753-020-00261-5>

UNDRR. (2022). Global assessment report on disaster risk reduction 2022. United Nations Office for Disaster Risk Reduction. <https://www.undrr.org/publication/global-assessment-report-disaster-risk-reduction-2022>

World Bank. (2016). Case study: Iza! Kaeru Caravan in Japan. Washington, DC: World Bank. <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/920101468197354346>

Yano, C. R. (2013). Pink globalization: Hello Kitty's trek across the Pacific. Duke University Press. <https://doi.org/10.1515/9780822395869>