

Disaster Ranger: Development of a Digital Game for Teaching Disaster Preparedness in Kindergarten

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ABSTRACT

This study aimed to develop and evaluate a digital game for teaching disaster preparedness in kindergarten. Using a mixed-method exploratory sequential design through descriptive developmental interviews with disaster risk reduction management personnel and kindergarten teachers informed the game's design, while standardized quantitative survey evaluated the educational quality, acceptability, and usability using the Learning Resource Management and Development System (LRMDS) Evaluating Rating Sheet for Non-Print Materials, Technology Acceptance Model (TAM), and System Usability Scale (SUS). Results revealed that typhoons is most experienced disaster in the province, while teachers emphasized integrating disaster concepts through engaging and age-appropriate method. Evaluation showed a consistently high mean across all factors. A mean score of 3.87 in LRMDS Evaluating Rating sheet reflects that the digital game meet the educational standard of Department of Education. A mean score of 3.88 in TAM indicate that teachers accept the digital game as an instructional material, while the 94.9 SUS score indicates that the digital game has an exceptional usability in classroom settings. These findings highlight the importance of integration of disaster preparedness in kindergarten curriculum using an age-appropriate, localized, and interactive instructional material.

Keywords – Digital Game, Disaster Preparedness, Early Childhood, Game-Based Learning, Kindergarten.

INTRODUCTION

Disasters have become a recurrent feature in our lives, with the affected areas becoming wider. Nature and human-induced calamities are unplanned, sudden, and massive in their effects. The United Nations Office for Disaster Risk Reduction (2022) states that disasters are presently occurring five times the number that occurred in the 1970s. The growing frequency of disasters clearly indicates that we must urgently take strong steps in disaster management and resilience, including the whole community. Disaster risk reduction is one of the steps that can be taken towards achieving the Sustainable Development Goals (SDGs), most notably SDG 4 (Quality Education), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action).

The Philippines' geographical location explains why it is prone to natural calamities dangerous to the country, including earthquakes, typhoons, and flooding. According to Balita (2025), the major threat to the Philippines is an earthquake as the country scored 9.7 out of 10 risk index in earthquakes. At the same time, he also revealed that on average, the country is hit by 20 tropical cyclones that enter the Philippine Area of Responsibility every year therefore, the country is a disaster-prone one. The Philippines' vulnerability to disasters was shown by the fact that in less than 10 days, the country experienced three disasters: an earthquake of magnitude 6.9 and two typhoons (CARE, 2025). Constant exposure to disasters has led the country to be one of the most disaster-prone ones in the world. Hernando-Malipot (2025) stated that the country tops the World Risk Index 2025. The World Risk Index assesses the hazard levels associated not only with floods and typhoons but also the impacts of climate change. The data clearly depict the extent of threat that the flooding and typhoons bring but at the same time they reveal the likely effects of climate change.

Education is a major factor in lowering disaster risks by giving community members the ability through knowledge and skills. Despite having national policies, like Department of Education Order No. 37, s. 2015 that

mandates DRRM integration, the actual implementation at the school level often remains inconsistent (UNDRR, 2019). Traditional Disaster Risk Reduction implementation in the education strategies has been challenged for its approach of only treating children as passive recipients and not as active contributors to the process. Game-Based Learning (GBL) is an exciting and fun way of teaching that also happens to be closely in line with the philosophy of Early Childhood Education. By involving young learners through games, GBL can significantly enhance their level of engagement and motivation. This study addressed these gaps by developing an age-appropriate digital game for teaching disaster preparedness in kindergarten. This study, through the design and evaluation of the digital game, indirectly meets a critical local and global need, and it is a preliminary step towards a more resilient future.

Specifically, this study sought answers to the following questions:

1. What are the most commonly experienced disasters in Bulacan?
2. What are the teachers' perspectives on the current situation of disaster preparedness in kindergarten in terms of;
 - 2.1. Curriculum Integration; and
 - 2.2. Instructional Materials?
3. How may the DISASTER RANGER be developed in terms of;
 - 3.1. Intellectual Property Rights;
 - 3.2. Instructional and Technical Design Specification; and
 - 3.3. Functional and Technical Specifications?
4. How may the quality of DISASTER RANGER be evaluated in terms of:
 - 4.1. Content Quality;
 - 4.2. Instructional Quality; and
 - 4.3. Technical Quality?
5. How may the level of acceptability of DISASTER RANGER be evaluated in terms of;
 - 5.1. Perceived Usefulness;
 - 5.2. Perceived Ease to Use;
 - 5.3. Attitude Toward Using; and
 - 5.4. Intention To Use?
6. How may the DISASTER RANGER be evaluated in terms of its usability?

METHODOLOGY

Research Design

The study used a mixed-methods exploratory sequential design through the descriptive-developmental method. The qualitative phase involves interviewing to collect qualitative data from important key informants. The data will serve as the foundation for developing the digital game. On completion of the qualitative phase, digital game

development is based on the interview data. The second phase is carried out by means of a descriptive-developmental approach in which quantitative data is obtained from kindergarten teachers, master teachers, and Learning Resource Management and Development System (LRMDS) coordinators as validators. This phase offers methodical numerical data to assess the educational appropriateness, technological acceptability, and system usability of the digital game developed.

Participants and Respondents

A purposive-convenience sampling technique will be employed to select both participants and respondents based on their expertise and professional experience, ensuring that they can provide informed and meaningful feedback on the developed digital game. The researchers also selected cooperating schools where they were previously assigned during their Teaching Internship, facilitating accessibility and congenial relationships. These central schools are considered big schools in Bulacan, making them appropriate settings for evaluating the digital game. Additionally, the schools' geographic location was considered in the selection process, as they are often vulnerable to disasters such as flooding, which aligns with the focus of the study on disaster preparedness education.

This study involved five ($n=5$) personnel from the Disaster Risk Reduction and Management Office (DRRMO), have at least 3 years of experience in the field and three ($n=3$) kindergarten teachers from the selected central schools in Bulacan, have at least three years of teaching experience such that they have even experienced the transition from K-12 curriculum to the Revised K-12 Curriculum, for the qualitative phase.

Santos (2023) utilized 25 teachers to test the usability and acceptability of a new educational resource, the development of which is also the reason why the current research team decided to use a similar number of participants. Therefore, the participants of the research are 25 kindergarten teachers, 4 master teachers, and 1 LRMDS coordinator. These 25 kindergarten teachers and 3 master teachers are from the same selected central schools in Bulacan, where each school has approximately five to eight kindergarten teachers. The LRMDS coordinator served as the expert validator of the digital game.

Research Instrument

Data were collected using a semi-structured interview guide and standardized and adapted rating scales to evaluate the developed digital game. The DepEd (2009) Learning Resource Management and Development System (LRMDS) Rating Sheet for Non-Print Material evaluated the content, technical, and functional quality. The Technology Acceptance Model from the study by Weng et al. (2018) is adopted to evaluate the acceptability of the game, and the System Usability Scale by Lewis (2018) in his study was adopted to assess the perceived usability of the digital game.

TAM and SUS have been used in different educational technology researches. Santos (2023) utilized both TAM and SUS to evaluate their developed Game-based Assessment Tool (GBAT), while another study of Santos (2025) also used the same instrument for a descriptive-developmental that evaluated an Interactive Teaching Resources (ITR)

These instruments were validated to ensure the applicability and appropriateness of each statement. It was submitted to a panel of experts with a primary objective to confirm that the language and construction of adopted scales are comprehensive and relevant to the nature of the study. Feedbacks from validators are reviewed and considered to enhance the instruments.

Data Gathering Procedure

This study followed a systematic and ethical data collection process. First, formal permission was secured from the respective offices. Upon receiving the approval, the first phase was started. Semi-structured interviews are conducted with DRRMO personnel and three kindergarten teachers. These interviews aim to gather insights regarding existing disaster preparedness practices, instructional gaps, and recommendations for integrating disaster risk reduction concepts into the kindergarten curriculum. The qualitative data collected served as the

foundation for the development of the digital game. The qualitative phase involved eight participants, and data saturation was achieved despite the modest sample size. The homogeneity of expertise among participants, combined with the focused scope of evaluating a single digital game, ensured that the data collected was both rich and sufficient. Thus, the validity of the qualitative findings rests not on the number of participants alone, but on the depth, relevance, and convergence of their contributions

After the development of the digital game, the quantitative phase proceeds. Twenty-five kindergarten teachers, three master teachers, and one LRMDs Coordinator served as respondents. The evaluation scale is adopted and modified from the LRMDs, SUS, and TAM evaluation tools, and it is validated by ECE experts.

The interviews and survey questionnaires were administered at the participants' and respondents' available time, with confidentiality and the voluntary nature of participation emphasized. Feedback and insights obtained from the respondents are used to refine and enhance the digital game. After the completion of data collection, all responses and interview transcripts are reviewed for completeness and accuracy before being organized and prepared for thematic and statistical analysis.

Data Processing and Statistical Treatment

After successful data gathering, the responses from the interviews and survey questionnaires are organized, tabulated, interpreted, and subjected to descriptive statistical analysis, and common themes are found to address the specific research problems.

Figure 1. Phases of Thematic Analysis

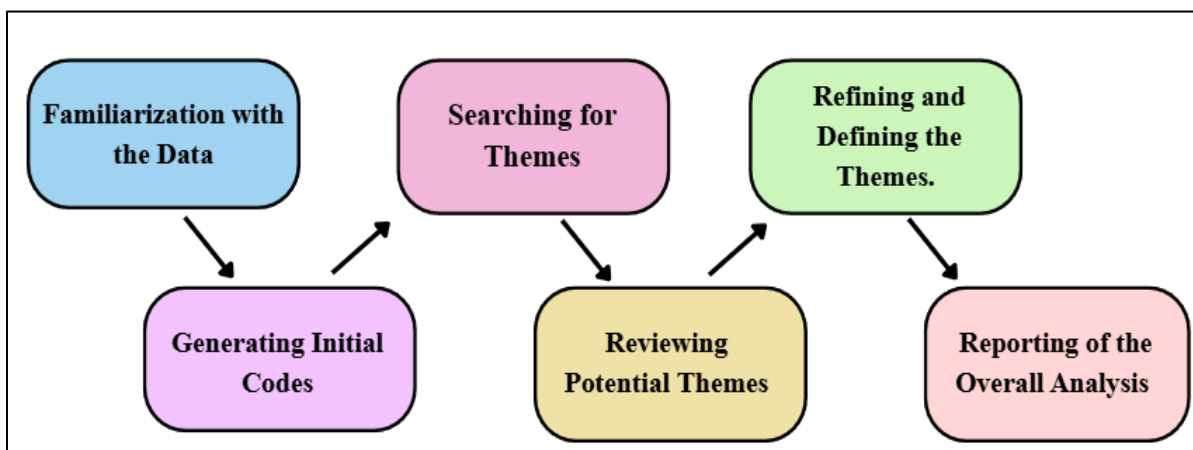


Figure 1 showed that the six phases of thematic analysis, developed by Braun and Clarke (2006), This study used it as a primary tool to analyzed the collected qualitative data. It helped to analyze a qualitative study in a step-by-step manner.

Phases 1 is about Familiarization with the data. The interviews are transcribed, where the audio is converted from the kindergarten teachers regarding their disaster experiences and curriculum needs into written text. After turning into text, the transcript is read multiple times to understand the data. Phase 2 involves generating initial codes. This mainly identifies texts that are relevant to the statement of the problem. Then coding happens where there are labels assigned to the segments found. To have a systematic approach, researchers ensure that the dataset is coded to understand all the teachers' perspectives. Phase 3 is about searching for themes. Researchers organized data into individual codes that show patterns or themes. After possible themes have been identified, they mapped them. The mapping of the themes visually can help explain how codes are combined to form actual themes that address the SOP. Phase 4 is about reviewing potential themes. Checking the themes against the original coded extracts to ensure the participants are represented, and based on what was mentioned. The researchers merge similar themes or split a theme if it is too broad. Phase 5 discusses the definition and actual name of the themes. This is where the themes identify what is unique and important about each. Once identified, making a descriptive name for the themes is decided what will appear in the final paper. Lastly is Phase 6 is

about producing the report or the overall analysis of the interview. The synthesis of the paper is mentioned where it discusses together the analytical narrative and the data extracts. After analyzing the findings, the results provided with proper evidence. Selecting quotes from kindergarten teachers support what was founded as themes.

For the quantitative phase, which evaluate the educational quality, accessibility, and usability, descriptive statistical analysis is utilized. which included statistical treatment, specifically mean and standard deviation. Thus, mean scores are interpreted using established descriptive scales corresponding to each part of the questionnaire.

The System Usability Scale (SUS) was employed to assess the usability of the digital game by computing the mean scores for each item and then applying the standard adjustment formula ($mean - 1$). The SUS scores is the product of 2.5 and adjusted scores. This converts into a standardized 0-100 metric.

RESULTS AND DISCUSSION

This demonstrates the process of development along with the findings of the study. It presents a detailed analysis of the data collected and processed from the interviews with DRRM personnel and three kindergarten teachers, and evaluation tools completed by one LRMDs coordinator, 3 master teachers, and 25 kindergarten teachers to determine the content, usability, and acceptability of Disaster Ranger inside the classroom. It provides a detailed discussion of the findings following the specific problems.

Part I. Most Commonly Experienced Disaster in Bulacan

The data were interpreted based on the ranking of disasters that were commonly experienced in the province

Figure 2. Most Experienced Disaster in Bulacan

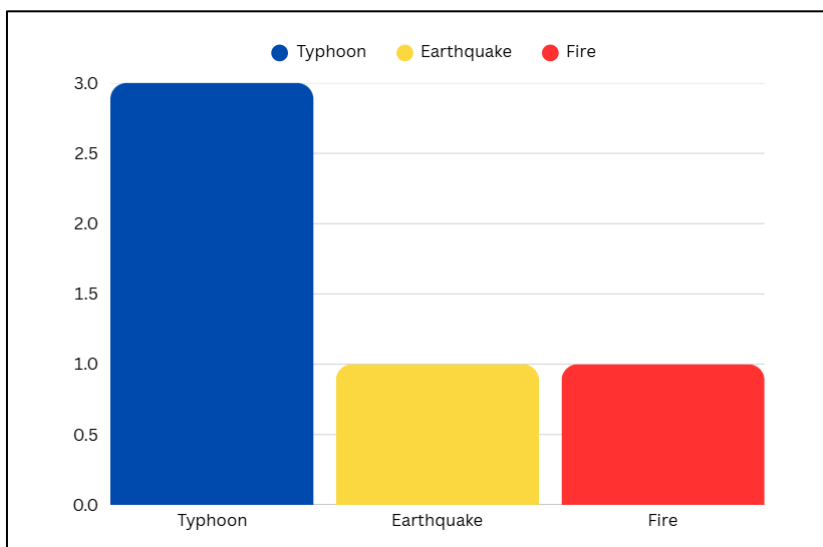


Figure 2 discusses the ranking of the most experienced disasters in Bulacan. It shows that typhoons rank first, with a frequency score of 3. In comparison, earthquakes and fires rank lower, with a frequency score of 1. This interpretation was based on the occurrences of disasters. These frequency scores were derived by simply counting the number of times each hazard was identified by participants, and thus they reflect descriptive tallies rather than statistical measures. Given the limited sample size, these results should be interpreted cautiously, as small counts do not necessarily indicate broader trends across the province.

According to the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), the Philippines is prone to typhoons due to its geographical location. Each year, about 20 typhoons enter the Philippine Area of Responsibility (PAGASA, nd). This also reflects the province’s geographical exposure to

tropical cyclones. While the ranking of earthquakes and fires indicates its less frequency. Nevertheless, all disasters have significant impacts when they occur

The lower ranking of earthquakes and fires indicates that while these hazards are present, they occur less frequently compared to typhoons. Nevertheless, their inclusion in the ranking underscores the need for preparedness measures across multiple hazards, as even less frequent disasters can have significant impacts when they occur.

Part II. Perspectives in Teaching Disaster Preparedness

Table 1. Summary of Integration of Disaster Preparedness in Kindergarten Curriculum

Respondents	Categories	Themes and subthemes
1-2	IN VIVO: "gently and creatively added into the curriculum." IN VIVO: "necessity for young learners."	Theme: Integration of Disaster Preparedness Subthemes: Curriculum integration
3	T: learns best through play	Play-based and age-appropriate pedagogy

Table 1 discusses that disaster preparedness should not be treated as an isolated subject but rather be integrated into daily learning experiences. This reflects the perspective that disaster preparedness is a necessity in kindergarten as the foundation for such situations. The codes “gently and creatively added into the curriculum” support the idea that disaster preparedness is a foundational aspect of early learning.

This suggests that it should be a vital component for child development. Integrating it to curriculum would benefit the development of resilience and confidence of every student. Overall, the integration reflects a progressive and proactive approach of schools to foster the culture of readiness from the earliest stage

Table 2. Summary of Technology integration in teaching Disaster Preparedness

Respondents	Categories	Themes and subthemes
1-2	IN VIVO: “digital game... interactive tool... fun and engaging way.” IN VIVO: “Integrating the game into lessons, builds awareness and confidence age-appropriate”	Theme: Technology integration in teaching Disaster Preparedness Use of digital tools for teaching game-based simulation
3	T: Children could learn in a simple scenario	

Table 2 presents the perspective of teachers on the integration of technology into disaster preparedness in education. Kindergarten teachers support the role of digital games as a medium of teaching disaster preparedness. These results underscore a theme that supports that technology transforms preparedness from a potentially intimidating subject into a fun and engaging way.

PART III. Development of Disaster Ranger in terms of LRMDS Non-Print Guidelines

This study used LRMDS Guidelines for Non-Print Materials to developed the digital game. It involved Intellectual Property Rights, Instructional and Technical Design Specification, and Functional and Technical Specification.

Table 3. Development of DISASTER RANGER in terms of Intellectual Property Rights

MATERIALS USED	SOURCES	LICENSE TYPE
Graphics/Visuals	University puppets	Free
Game Icon	Canva and Researchers' Digital Art	Free
Background Music	Youtube	Royalty-Free

The researchers prioritized upholding ethical sourcing and accessibility of the digital game. The graphics and visuals were adapted from the puppets of a university in Bulacan to ensure contextual reference while maximizing free-use provisions. For game icons, the researchers use Canva elements with original digital artworks. To ensure engagement, background music is added from YouTube under a royalty-free license. Collectively, these processes reflect an academically committed to innovation, responsibility, and inclusivity.

Figure 3. Development of DISASTER RANGER in terms of Instructional and Technical Design Specification



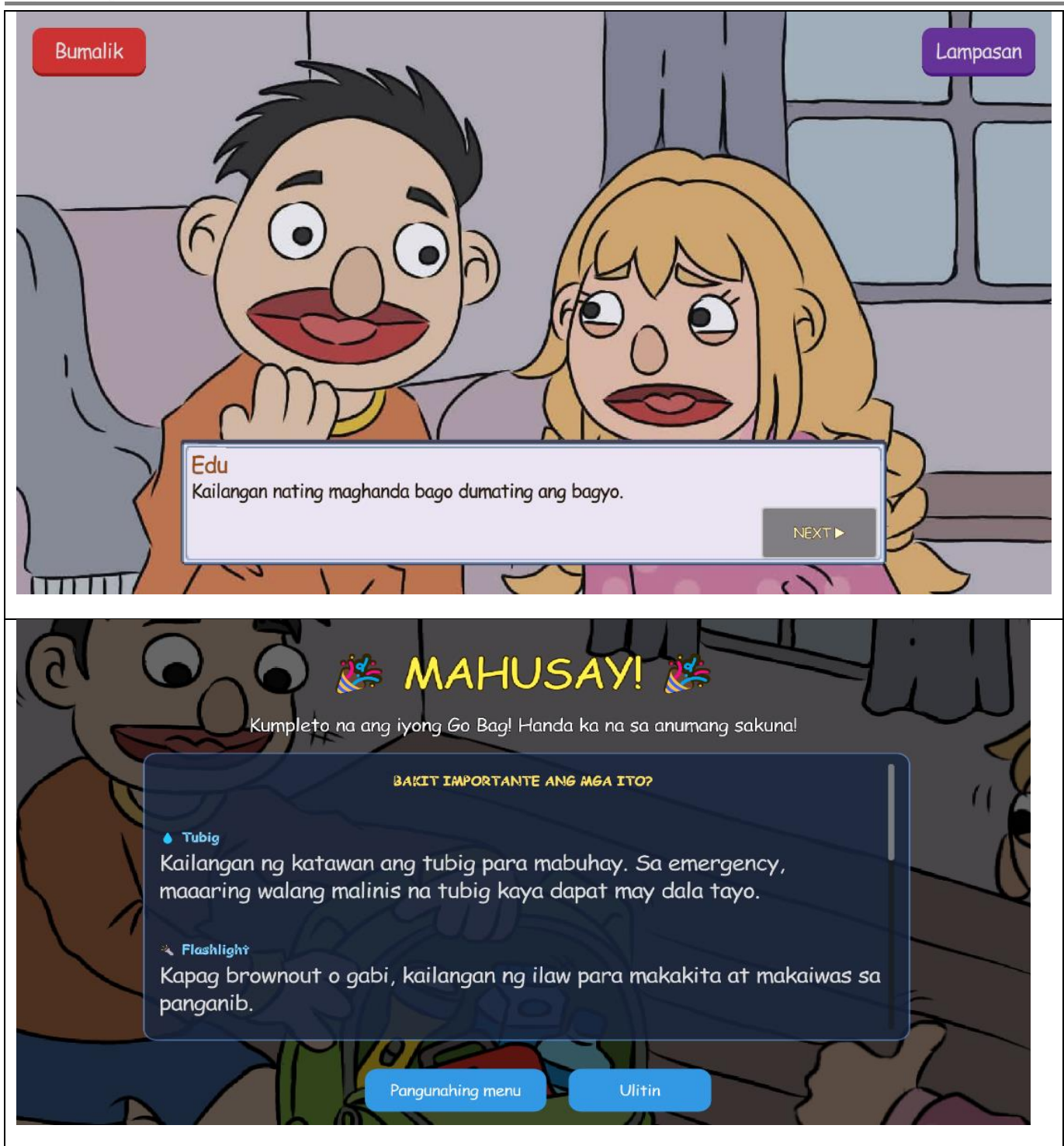


Figure 3 shows how DISASTER RANGER was developed in terms of the instructional and technical design specifications. The digital game was designed for teaching disaster preparedness in Kindergarten, which was considered, as the researcher added scaffolded instructions for kindergarten students. The instructional design should emphasize play-based learning to ensure technicality. Immediate feedback was added to instantly correct the mistakes of students.

The LRMS (2009) emphasizes the importance of educational approach and accessible digital resources in supporting the curriculum delivery, but alignment with DepEd standards for Non-Print Materials. On the technical side, the research ensured that the digital game was engaging, responsive, and easy to navigate by utilizing a lightweight navigation using drag and drop mechanics.

The game was divided into 4 core activities, namely: Pack Patrol, Earth-quake, Heat Retreat, and Fashion Forecast

- a) **Pack Patrol**, is an activity that aims to teach Go-Bag Preparation. It teaches students what things they need to pack in case of an emergency. It provides immediate feedback to correct mistakes instantly
- b) **Earth-quick**, is an activity that aims to teach the basic safety precautions like Duck, Cover, and Hold, which is the most important thing they should know during an earthquake
- c) **Heat Retreat**, is an activity that aims to teach basic safety precautions during fire, like Stop, Drop, and Roll.
- d) **Fashion Forecast** is an activity that is familiar to children because it is part of their daily routine. It aims to teach children to choose the right clothes for specific weather.

At the beginning of the game, there is an original story with a voiceover to engage or give background to the game and to align with the multisensory learning approach. In the end, an information panel will appear that teachers may use to expand the discussion of the lesson taught in every activity. Nurjanah et al. (2024) stated that a multisensory approach has a positive impact on material comprehension and students' enthusiasm for learning.

Figure 4. Development of DISASTER RANGER in terms of Functional and Technical Specification

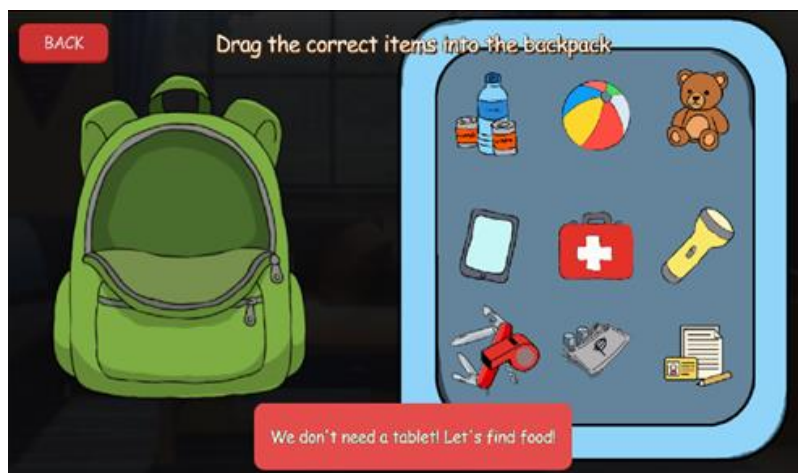


Figure 4 presents how Disaster Ranger was developed in terms of functional and technical specifications. The functional area was designed to examine the Kindergarten students' awareness by incorporating realistic scenarios in the gameplay. The content was guided by the Disaster Risk Reduction and Management (DRRM) framework.

The researcher employed a lightweight engine to support touch-based interaction and drag-and-drop mechanics. Multimedia integration, such as narration and colorful graphics, was optimized for clarity and fast loading, consistent with usability principles emphasized in recent disaster resilience initiatives.

PART IV. Evaluation of Disaster Ranger in terms of LRMDs Non-Print Guidelines

As shown in Table 4, the findings indicate that the developed digital game passed the educational standard of DepEd's LRMDs Evaluating Rating Scale for Non-Print Material. All factors were rated high in terms of mean scores.

Table 4. Evaluation of DISASTER RANGER using LRMDs Tool for Non-Print Material

Factors	MEAN	SD	DESCRIPTION	INTERPRETATION
1. Factor A. Content Quality	3.80	0.17	Very Satisfactory	PASSED
2. Factor B. Instructional	3.83	0.11	Very Satisfactory	PASSED

Quality				
3. Factor C. Technical Quality	3.87	0.13	Very Satisfactory	PASSED
4. Factor D. Other Factors	4.00	0.00	Very Satisfactory	PASSED
TOTAL	3.87	0.08	Very Satisfactory	PASSED

Table 4 indicates that the overall mean for content, instructional, and technical quality was 3.87. The overall standard deviation was 0.08, and the descriptions of each factor are Very Satisfactory. It meant that the majority of the evaluators agreed that the DISASTER RANGER met the educational standard and could help kindergarten students to actively participate in the game through the different activities included.

Factor D obtained the highest rating among four factors with a mean score of 4.00, which indicates that the DISASTER RANGER is free from grammatical, factual, and conceptual errors that ensure the educational quality of the digital material. Factor B: Instructional Quality (M= 3.83, S= 0.11) and Factor C: Technical Quality (M= 3.87, S= 0.13) also rated high, which means that the purpose of the material is well-defined and is free from technical problems. On the other hand, Factor A obtained the lowest rating with a mean score of 3.80 and a standard deviation of 0.17. Compared to other factors, this area still achieved a Very Satisfactory rating, indicating that the contents are up-to-date, free from cultural bias, and relevant to real life situation top the evaluation indicates that Disaster Ranger was timely and relevant to children's daily life. However, it needs a content improvement to promote positive values that support formative growth.

The consistent high rating of DISASTER RANGER in LRMDs Evaluating Rating Sheet for Non-Print Materia echoed Mayer’s Cognitive Theory of Multimedia Learning (2003) that stated that a well-structured instructional material reduces the cognitive load of the students and promotes active participation, which is the objective of this study.

The relatively lower score for Content Quality suggests that improvements are needed to further enhance the material’s ability to promote positive values and support formative growth.

PART V. Level of Acceptability of Disaster Ranger

As shown in Table 5, the findings indicate that the developed digital game is highly acceptable by the kindergarten teachers. All factors were rated high in terms of mean scores.

Table 5. Evaluation of DISASTER RANGER using the Technology Acceptance Model

Factors	MEAN	SD	DESCRIPTION	INTERPRETATION
1. A. Perceived Usefulness	3.84	0.20	Strongly Agree	Highly Acceptable
2. B. Perceived Ease to Use	3.90	0.13	Strongly Agree	Highly Acceptable
3. C. Attitude Toward Using	3.97	0.08	Strongly Agree	Highly Acceptable
4. D. Intention To Use	3.82	0.15	Strongly Agree	Highly Acceptable
OVERALL	3.88	0.10	Strongly Agree	Highly Acceptable

Table 5 presents that the overall mean for Perceived Usefulness, Perceived Ease to Use, Attitude Toward Using, and Intention to Use was 3.88. The overall standard deviation was 0.10, and the descriptions of each factor strongly agree. It meant that the majority of the evaluators agreed that DISASTER RANGER is well-positioned for acceptance, aligning with broader TAM-based evaluations of educational games.

Factor C: Attitude Toward Using obtained the highest rating among the four factors with a mean score of 3.97, which indicates that the DISASTER RANGER has a valuable impact on classroom discussion. Factor A: Perceived Usefulness (M= 3.84, S= 0.20) and Factor B: Perceived Ease to Use (M= 3.90, S= 0.13) also rated high, which means that it is easy to apply Disaster Ranger in class, and it helps teachers improve their pedagogy of teaching.

On the other hand, Intention to Use received the lowest rating (M = 3.82, SD = 0.15). Although still within the Highly Acceptable range, this finding points to practical challenges. Teachers expressed strong agreement with adopting the game but noted difficulties related to limited resources and the lack of integration of disaster preparedness in the kindergarten curriculum. This suggests that while the material is pedagogically sound, its sustained classroom adoption may depend on institutional support, resource allocation, and curriculum alignment.

PART VI. Level of Usability of Disaster Ranger

This part discussed the results of the SUS rating scale in evaluating the usability of DISASTER RANGER. Mean, standard deviation, and SUS scores were utilized to assess the overall appearance of the digital game.

Table 6. Evaluation of Disaster Ranger using System Usability System

Factors	MEAN	ADJUSTED SCORE	DESCRIPTION
1. I would use the Disaster Ranger game as instructional material in my class.	5.00	4.00	Strongly Agree
2. I found the Disaster Ranger game to be simple	4.76	3.76	Strongly Agree
3. The Disaster Ranger game is easy to use.	4.60	3.60	Strongly Agree
4. I could use the Disaster Ranger game without the support of a technical person during my class.	4.76	3.76	Strongly Agree
5. I found the different features in the Disaster Ranger game are well integrated.	4.60	3.60	Strongly Agree
6. There was a lot of consistency in the Disaster Ranger game.	4.92	3.92	Strongly Agree
7. Most kindergarten teachers will learn to use the Disaster Ranger game.	4.88	3.88	Strongly Agree
8. The Disaster Ranger game is very intuitive.	4.84	3.84	Strongly Agree
9. I am very confident using the Disaster Ranger game.	4.80	3.80	Strongly Agree
10. I could use the Disaster Ranger game without having to learn anything new.	4.80	3.80	Strongly Agree
TOTAL	47.96	37.96	
SUS SCORE		94.9	Best Imaginable

Table 5 shows the findings using the evaluation of Disaster Ranger in terms of its usability. Each factor were evaluated using the mean scores to be computed to get the SUS scores. The highest value recorded was “I would

use the Disaster Ranger game as instructional material in my class gathering a mean score of 5 The lowest value gathered a mean score of 4

The SUS Scores were computed by getting the sum of the adjusted scores (mean scores – 1), then it would be multiplying to 2.5. The SUS score computed is 94.9 which indicates that the digital game is Best Imaginable or have an exceptional usability.

The findings of TAM complement the results of SUS in terms of ease of use and perceived usefulness influence adoption. The consistent high usability ratings of Disaster reinforced TAM's claim that when instructional materials are intuitive and useful, it develops a strong intension to use and apply in the classroom settings.

CONCLUSION

The findings of this study conclude that kindergarten teacher are interested in integrating disaster preparedness education into the kindergarten curriculum, as well as into their classes. Pohan et al (2024) recommend systematically integrating disaster preparedness education into the elementary school curriculum to shape and prepare these students in a long-term emergency response behavior. According to Kaminski (2024), game-based learning has shown a constant improvement in children's development.

Disaster Ranger, a digital game instructional material, was developed to assist kindergarten teachers in teaching students about disaster preparedness. Teachers can access an instructional material of high quality, culturally relevant, and highly usable, which they are willing to adopt as the best. The development of Disaster Ranger considered the gradual, play-based, and gamified learning strategies to enhance comprehension and engagement; the usability-oriented design to ensure adoption; and the institutional context, such as the LRMDs, to support the alignment with national standards.

High usability and acceptability scores reflect that the teachers regard Disaster Ranger as a tool that is not only functional and sustainable but also capable of effectively integrating educational innovation with the actual classroom impact, thereby giving young learners knowledge of the disasters that most threaten their community. This could act as one of the ways to integrate disaster preparedness in the kindergarten curriculum.

RECOMMENDATION

The researchers followed some considerations and can be advised to practice them in further performance of the digital game, Disaster Ranger, which aimed to teach disaster preparedness in kindergarten. Therefore, from the conclusions, the following are recommended:

1. The focus of the study is limited only to the development of the digital game and a short implementation to evaluate the educational soundness, system usability, and acceptability. It is suggested to implement this material in a kindergarten classroom set-up to explore the effectiveness of the digital game for long-term retention of teaching disaster preparedness or any related topic.
2. The respondents of this study were exclusively female, with no male kindergarten teachers represented. The study recommends expanding the respondent base to include gender diversity
3. It is recommended to enhance the instructional material by integrating additional features such as audio support. This multimodal approach allows learners to engage multiple senses simultaneously, thereby improving comprehension, retention, and overall learning experience.
4. It is recommended to revisit the kindergarten curriculum to explicitly integrate disaster preparedness as a core topic, rather than limiting it to values integration within lessons. Embedding disaster preparedness directly into the curriculum ensures that young learners develop practical awareness and age-appropriate skills for safety and resilience

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