Project-Based Learning on the Scientific Literacy and Disaster Preparedness of Grade 7 Science Students

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Abstract
This study examined the effects of Project-Based Learning (PjBL) on the scientific literacy and disaster preparedness of Grade 7 students in earthquake-related science instruction, and also determined whether a significant difference existed between pretest and posttest scores following the intervention. Grounded in Constructivist Theory and Experiential Learning Theory, the study employed a quasi-experimental one-group pretest–posttest design involving 36 Grade 7 students selected through purposive sampling. Two validated instruments were used: a 30-item Scientific Literacy Test and a 35-item Disaster Preparedness Questionnaire focused on earthquake concepts. Results revealed a significant increase in scientific literacy scores from pretest ($M = 6.56$, $SD = 1.90$) to posttest ($M = 12.06$, $SD = 5.51$), $t(35) = 5.18$, $p < .001$, with a large effect size ($d = 0.863$). Similarly, disaster preparedness scores significantly improved from pretest ($M = 55.4$, $SD = 14.7$) to posttest ($M = 94.1$, $SD = 36.3$), $t(35) = 5.15$, $p < .001$, also indicating a large effect size ($d = 0.858$). These findings indicate that PjBL significantly enhanced students' scientific understanding and disaster preparedness skills. The study concludes that Project-Based Learning is an effective instructional approach for improving both scientific literacy and disaster preparedness in earthquake education. The findings provide empirical support for integrating PjBL within science education and Disaster Risk Reduction and Management (DRRM) initiatives. The proposed instructional materials may benefit science teachers, curriculum developers, and learners by promoting meaningful, contextualized, and experiential learning aligned with real-world disaster preparedness.
Keywords: *project-based learning; scientific literacy; disaster preparedness; quasi-experimental design; t-test analysis*

1. Introduction

Scientific literacy and disaster preparedness have become increasingly important competencies in the twenty-first century educational landscape. Scientific literacy refers to the ability of individuals to understand scientific concepts, evaluate evidence, solve problems, and apply scientific knowledge to real-life situations, while disaster preparedness involves the knowledge, attitudes, and practices necessary to reduce risks and respond effectively during disasters. Despite the growing emphasis on these competencies, many students around the world continue to demonstrate low levels of scientific literacy and inadequate disaster preparedness. Results from international assessments such as the Programme for International Student Assessment (PISA) consistently reveal that many learners struggle with scientific reasoning, interpretation of data, and application of scientific concepts in practical situations. Reports from the Organisation for Economic Co-operation and Development (OECD) showed that Filipino students ranked among the lowest in science performance in the PISA 2018 assessment, indicating persistent challenges in science education within the Philippines. The situation is particularly alarming because the country is highly vulnerable to natural hazards due to its location along the Pacific Ring of Fire, making earthquake preparedness an essential competency among learners.

Several local studies have highlighted the existing concerns regarding students' scientific literacy and disaster preparedness in the Philippine context. Cahapay and Ramirez (2019) found that the level of science literacy among Grade VIII students was significantly associated with their level of disaster preparedness, suggesting that students who possess better understanding of scientific concepts are more capable of responding appropriately to disaster situations. Similarly, Bernal and Apdohan (2023) reported that Senior High School students in Sibagat, Agusan del Sur demonstrated varying levels of environmental and disaster risk literacy, emphasizing the need for strengthened disaster education programs in schools. These findings suggest that many learners still lack sufficient competencies necessary for effective disaster response and risk reduction. Although Disaster Risk Reduction and Management (DRRM) concepts have already been integrated into the Philippine

curriculum, several students continue to demonstrate limited understanding of earthquake preparedness procedures and disaster-related scientific concepts. This condition highlights the necessity for more effective and engaging instructional approaches that can simultaneously improve scientific literacy and disaster preparedness among learners.

In response to these educational challenges, learner-centered instructional strategies such as Project-Based Learning (PjBL) have been recognized as promising approaches for improving students' understanding and practical competencies. Project-Based Learning engages students in inquiry-driven, collaborative, and authentic learning experiences where they actively investigate real-world problems and develop meaningful solutions. Carlina and Djukri (2018) emphasized that project-based learning grounded on local potential significantly improved students' environmental literacy by allowing learners to connect classroom concepts with real-life environmental issues. Similarly, Freeman et al. (2014) found that active learning strategies significantly improved student achievement in science and mathematics courses compared to traditional lecture-based instruction. Lazonder and Harmsen (2016) further explained that inquiry-based and project-based approaches enhance scientific reasoning, conceptual understanding, and student engagement. These studies indicate that Project-Based Learning promotes deeper learning experiences by encouraging students to actively participate in problem-solving, collaboration, and contextualized learning activities.

Building on these findings, previous researchers have also emphasized the positive contribution of inquiry-driven and experiential learning approaches in enhancing scientific literacy and disaster awareness. Oliver et al. (2021) reported that inquiry-based science instruction positively influences students' scientific literacy outcomes by improving their ability to analyze evidence and apply scientific concepts in practical contexts. In disaster education, Singh and Linthoingambi (2024) revealed that collaborative and experiential educational interventions improved students' disaster preparedness behaviors and awareness. Likewise, Libayao et al. (2024) highlighted the effectiveness of contextualized disaster education in improving disaster awareness among Filipino learners. These findings suggest that experiential and project-based instructional approaches can help students connect scientific concepts with realistic disaster situations, thereby enhancing both conceptual understanding and preparedness behaviors. However, despite the growing body of literature supporting Project-Based Learning and disaster education, limited studies have simultaneously examined the effects of Project-Based Learning on both scientific literacy and disaster preparedness among junior high school students in the Philippine setting.

Existing studies commonly focus only on academic achievement, environmental literacy, or disaster awareness separately, leaving a gap in understanding how Project-Based Learning can influence both scientific literacy and disaster preparedness simultaneously. Although learner-centered approaches have been shown to improve science learning, limited studies have examined their role in strengthening disaster preparedness competencies among junior high school students. Furthermore, few local studies have specifically focused on earthquake-related science lessons among Grade 7 students despite the relevance of earthquake preparedness in the Philippine context. Addressing this gap is important because earthquakes remain one of the most destructive natural hazards in the Philippines, highlighting the need for instructional approaches that promote both scientific understanding and preparedness skills. Through meaningful and experiential activities, Project-Based Learning may help students apply scientific concepts to real-life disaster situations while enhancing collaboration, problem-solving, and decision-making skills. Thus, this study aimed to determine the effectiveness of Project-Based Learning on the scientific literacy and disaster preparedness of Grade 7 Science students in earthquake-related lessons.

This study was anchored on Constructivist Theory proposed by Jean Piaget and the Experiential Learning Theory developed by David Kolb. Constructivist Theory emphasizes that learners actively construct knowledge through experiences, interactions, and problem-solving activities rather than passively receiving information from teachers. In Project-Based Learning, students engage in collaborative inquiry, investigation, and authentic tasks that allow them to develop deeper understanding through active participation. Experiential Learning Theory, on the other hand, highlights the importance of learning through concrete experiences, reflection, conceptualization, and active experimentation. Through Project-Based Learning activities such as hazard mapping, earthquake simulations, and disaster preparedness planning, students are provided with meaningful experiences that connect classroom learning to real-world applications. These theoretical foundations support the idea that meaningful and experiential learning activities can enhance both scientific literacy and disaster preparedness competencies among students.

The primary purpose of this study was to determine the effectiveness of Project-Based Learning in improving the scientific literacy and earthquake disaster preparedness of Grade 7 students

in the School Year 2025-2026. Specifically, the study sought to answer the following research questions:

1. What are the mean pretest and posttest scores of Grade 7 students in the Scientific Literacy Test on earthquakes before and after the implementation of Project-Based Learning?
2. What are the mean pretest and posttest scores of Grade 7 students in the Disaster Preparedness Test on earthquakes before and after the implementation of Project-Based Learning?
3. Is there a statistically significant difference between the pretest and posttest mean scores in scientific literacy and disaster preparedness on earthquakes among Grade 7 students after the implementation of Project-Based Learning?
4. What Project-Based Learning instructional materials integrating DRRM concepts into Grade 7 Science lessons may be developed based on the results of the study?

The findings of this study are significant to science teachers, school administrators, curriculum developers, students, and future researchers. For science teachers, the study provides evidence regarding the effectiveness of Project-Based Learning as an instructional strategy for improving scientific literacy and disaster preparedness. The findings may encourage teachers to adopt more learner-centered and inquiry-based approaches in science instruction. For school administrators and curriculum developers, the study provides empirical support for integrating Project-Based Learning and contextualized disaster education into the curriculum. For students, the intervention promotes meaningful learning experiences that improve scientific understanding and preparedness skills essential for real-life situations. Future researchers may also use the study as a basis for conducting similar investigations involving larger samples, longer intervention periods, and different disaster-related topics. Overall, the study contributes to the growing body of literature on Project-Based Learning, science education, and disaster preparedness in the Philippine educational context.

2. Methodology

2.1. Research Design

The study employed a quantitative quasi-experimental one-group pretest-posttest research design. According to Creswell and Creswell (2018), quasi-experimental designs are appropriate for determining the effects of interventions when random assignment of participants is not feasible. The design involved administering pretests to measure the initial levels of scientific literacy and disaster preparedness among students, implementing the Project-Based Learning intervention, and administering posttests to determine changes after exposure to the intervention.

2.2. Research Locale

The study was conducted at a public junior high school located in Tacloban City during the School Year 2025–2026. The school is a public secondary institution under the Department of Education that offers junior high school education to students from diverse socioeconomic backgrounds. Tacloban City is considered vulnerable to natural disasters such as earthquakes, floods, and typhoons, making disaster preparedness education highly relevant to the learners.

2.3 Research Participants

The participants of the study consisted of 36 Grade 7 students selected through purposive sampling from one intact class section. The inclusion criteria required participants to be officially enrolled Grade 7 students, present during the intervention period, and willing to participate in the study. Initially, 38 students were included; however, two students were excluded because of incomplete attendance and missing posttest data. The participants were between 12 and 14 years old and had prior exposure to basic science concepts under the K to 12 curriculum.

2.4. Research Instruments

Two validated instruments were utilized in the study. The first instrument was a 30-item Scientific Literacy Test designed to assess students' understanding of earthquake-related scientific concepts, scientific reasoning, interpretation of data, and application of scientific knowledge. The second instrument was a 35-item Earthquake Disaster Preparedness Questionnaire using a five-point Likert scale that measured students' awareness, preparedness behaviors, attitudes, and readiness during earthquake situations. Both instruments underwent content validation by experts in science education and educational research to ensure alignment with the Grade 7 curriculum competencies and research objectives. Pilot testing was conducted among 30 Grade 7 students who were not included in the actual study. Reliability testing using Cronbach's alpha yielded coefficients of 0.748 for the Scientific Literacy Test and 0.733 for the Disaster Preparedness Questionnaire, indicating acceptable internal consistency.

2.5. Data Gathering Procedures

The conduct of the study followed several phases. First, the researcher secured approval from the Graduate School of Leyte Normal University, the school principal, and the science teacher concerned prior to the conduct of the study. Consent and assent procedures were completed before involving the participants. After obtaining permission, the validated research instruments were administered as pretests to determine the students' initial levels of scientific literacy and earthquake disaster preparedness. The administration of the tests was conducted inside the classroom under the supervision of the researcher and the science teacher. Following the pretest administration, the Project-Based Learning intervention was implemented for two weeks during the Earth Science lessons on earthquakes and disaster preparedness. The intervention included collaborative and inquiry-based activities such as hazard mapping, earthquake simulations, fault modeling, disaster risk analysis, emergency response planning, and classroom presentations, where students collaboratively investigated earthquake-related problems and proposed practical preparedness solutions. After the intervention, the posttests were administered using the same Disaster Preparedness Questionnaire and a parallel form of the Scientific Literacy Test to minimize practice effects. Finally, the gathered data were organized, encoded, analyzed, and interpreted using appropriate statistical tools, and the findings were summarized and presented in tables with corresponding discussions.

2.6. Data Analysis

The gathered data were analyzed using jamovi version 2.6.26. Descriptive statistics such as mean, standard deviation, and mean per item were used to describe the levels of scientific literacy and disaster preparedness. Paired-samples t-test was employed to determine whether significant differences existed between the pretest and posttest scores of the students. Cohen's d was also computed to determine the magnitude of the intervention effect. According to Cohen (1988), effect sizes may be interpreted as small, medium, or large depending on the obtained value.

2.7. Ethical Considerations

The study strictly observed ethical standards throughout the research process. Permission to conduct the study was secured from the school administration and the Graduate School of Leyte Normal University. Participation in the study was voluntary, and students were informed about the objectives and procedures of the research prior to participation. Confidentiality and anonymity of the participants were ensured by coding the gathered data and avoiding the disclosure of personal information. The participants were also informed that they could withdraw from the study at any time without penalty. All collected data were used solely for academic and research purposes.

3. Results and Discussion

This section presents the findings of the study regarding the effects of Project-Based Learning on the scientific literacy and earthquake disaster preparedness of Grade 7 students. The findings are organized according to the research questions and hypotheses. Data were analyzed using jamovi version 2.6.26 through descriptive statistics and paired-samples t-tests. The results are presented systematically and interpreted based on the study's theoretical framework and related literature.

3.1. Scientific Literacy of Grade 7 Students Before and After the PjBL Intervention

This section presents the mean pretest and posttest scores of Grade 7 students in the Scientific Literacy Test on earthquakes before and after the implementation of Project-Based Learning (PjBL). The results provide an overview of the students' scientific literacy levels and serve as an initial basis for determining the effectiveness of PjBL in improving their understanding of earthquake-related concepts and scientific processes.

Table 1. Descriptive Statistics for the Mean Pretest and Posttest Scores of Grade 7 Students in the Scientific Literacy Test on Earthquakes

Test	N	Mean	SD	SE	Mean Per Item	Scientific Literacy Level	Interpretation
Pretest	36	6.56	1.90	0.317	0.22	Low	Limited understanding of scientific concepts and processes
Posttest	36	12.06	5.51	0.918	0.40	Moderate	Satisfactory understanding with developing application skills

The results revealed that the students obtained a low level of scientific literacy during the pretest, indicating limited understanding of earthquake-related scientific concepts and processes prior to the intervention. After the implementation of Project-Based Learning (PjBL), the students' posttest scores increased to a moderate level, reflecting improved understanding and developing application skills in science. The increase in the mean score suggests that the PjBL activities helped students

actively engage in inquiry, collaboration, and problem-solving tasks related to earthquakes. The experiential and learner-centered nature of the intervention allowed students to connect scientific concepts with real-life situations, which contributed to better comprehension and interpretation of scientific information. These findings imply that Project-Based Learning was effective in enhancing the scientific literacy of Grade 7 students in earthquake education.

3.2. Disaster Preparedness of Grade 7 Students Before and After the PjBL Intervention

The mean pretest and posttest scores of Grade 7 students in the Disaster Preparedness Test on earthquakes provided a quantitative basis for assessing changes in their understanding before and after the implementation of Project-Based Learning (PjBL). The pretest reflected students' initial knowledge and readiness, while the posttest indicated their improved performance after engaging in structured, learner-centered activities focused on earthquake preparedness. The comparison of means served as an indicator of PjBL's effectiveness in enhancing students' understanding of safety procedures, emergency responses, and appropriate actions during earthquake events.

Table 2. Descriptive Statistics for the Mean Pretest and Posttest Scores of Grade 7 Students in the Disaster Preparedness Test on Earthquakes

Test	N	Mean	SD	SE	Mean Per Item	Disaster Preparedness Level	Interpretation
Pretest	36	55.4	14.7	2.45	1.58	Low	Limited readiness and preparedness
Posttest	36	94.1	36.3	6.06	2.69	Moderate	Average preparedness; needs improvement

The results showed that students initially demonstrated a low level of disaster preparedness, indicating limited readiness and understanding of appropriate responses during earthquake-related situations. This suggested that before the intervention, learners had insufficient knowledge of safety procedures and emergency actions during seismic events. After the implementation of Project-Based Learning (PjBL), the posttest results showed an improvement, reflecting a transition to a moderate level of preparedness. The findings implied that the PjBL intervention contributed to the enhancement of students' earthquake disaster preparedness through active and learner-centered learning experiences.

3.3. Significant Difference Between the Pretest and Posttest Scientific Literacy Scores

This section presents whether there was a significant difference between the pretest and posttest scores in scientific literacy and disaster preparedness among Grade 7 students after the implementation of Project-Based Learning (PjBL). It compares students' baseline performance before the intervention with their post-intervention scores to determine the extent of learning gains in terms of knowledge, skills, and application of earthquake-related concepts. The analysis evaluates the effectiveness of PjBL in improving students' scientific literacy and disaster preparedness.

3.3.1. Paired-Samples t-Test Results for Scientific Literacy Scores

A paired-samples t-test was conducted to determine whether the increase in students' scientific literacy scores after the implementation of Project-Based Learning (PjBL) was statistically significant. This test was appropriate since it compared pretest and posttest scores from the same group of Grade 7 students on earthquake-related scientific literacy. Prior to the analysis, the assumptions were checked to ensure the validity of the results. The Shapiro-Wilk test indicated that the data were normally distributed, and no significant outliers were observed, confirming that the assumptions for parametric testing were met. These results justified the use of a paired-samples t-test to examine the significance of the learning gains.

Table 3. Paired Samples t-Test Results for Pretest and Posttest Scores of Grade 7 Students in the Scientific Literacy Test on Earthquakes

Measure Comparison	Mean Difference	SE Difference	t	df	p	Cohen's d	Interpretation
Posttest – Pretest	5.50	1.06	5.18	35	< .001	0.863	Significant

Note. A paired-samples t-test was conducted to compare students' scientific literacy scores before and after the intervention. Results revealed a statistically significant increase in posttest scores compared to pretest scores.

Table 3 presents the paired-samples t-test results comparing the pretest and posttest scientific literacy scores of Grade 7 students on earthquakes. The analysis revealed a statistically significant difference between the two sets of scores, $t(35) = 5.18$, $p < .001$, indicating that students achieved higher scientific literacy scores after the implementation of Project-Based Learning (PjBL). The computed effect size ($d = 0.863$) further indicated a large practical effect, suggesting that the intervention produced meaningful improvements in students' understanding and application of earthquake-related scientific concepts. These findings imply that the PjBL activities effectively enhanced students' ability to analyze scientific information, engage in inquiry, and apply concepts to

real-life disaster situations. The improvement may be attributed to the collaborative, experiential, and learner-centered nature of the intervention, which encouraged active participation, critical thinking, and problem-solving throughout the learning process.

The findings are consistent with the study of Lazonder and Harmsen (2016), which reported that inquiry-based learning with proper scaffolding improves science achievement and conceptual understanding. Similarly, Oliver, McConney, and Woods-McConney (2021) found that inquiry-oriented instruction enhances scientific literacy and student engagement in science education contexts. Furtak (2017) also emphasized that structured inquiry approaches positively influence students' academic performance and scientific reasoning skills. The present findings suggest that integrating PjBL in earthquake education helped students connect abstract scientific concepts with authentic experiences and practical applications. Overall, the results demonstrated that Project-Based Learning was effective in enhancing the scientific literacy of Grade 7 students.

3.3.2. Paired-Samples t-Test Results for Disaster Preparedness Scores

A paired-samples t-test was conducted to determine whether the increase in students' disaster preparedness scores after the implementation of Project-Based Learning (PjBL) was statistically significant. This test was appropriate as it compared pretest and posttest scores from the same group of Grade 7 students in earthquake disaster preparedness. Prior to analysis, the assumptions were checked, and results showed that the data were normally distributed with no significant outliers, confirming the suitability of a parametric test.

Table 4. Paired Samples t-Test Results for Pretest and Posttest Scores of Grade 7 Students in the Disaster Preparedness Test on Earthquakes

Measure Comparison	Mean Difference	SE Difference	t	df	p	Cohen's d	Interpretation
Posttest – Pretest	38.7	7.52	5.15	35	< .001	0.858	Significant

Note. A paired-samples t-test was conducted to compare students' disaster preparedness scores before and after the intervention. Results revealed a statistically significant increase in posttest scores compared to pretest scores.

Table 4 presents the paired-samples t-test results comparing the pretest and posttest disaster preparedness scores of Grade 7 students on earthquakes. The analysis revealed a statistically significant difference, $t(35) = 5.15$, $p < .001$, indicating that students performed significantly better after the implementation of Project-Based Learning (PjBL). The mean gain reflected a notable improvement in students' disaster preparedness, suggesting enhanced understanding of safety procedures, emergency response, and earthquake preparedness strategies. The effect size ($d = 0.858$) indicated a large practical effect, confirming that the improvement was not only statistically significant but also educationally meaningful. These results are consistent with the findings of Koca and Arkan (2020), who reported that structured disaster training significantly improves learners' preparedness and response self-efficacy, and Libayao et al. (2024), who found that project-based disaster learning enhances students' preparedness levels and retention of earthquake response procedures.

Similarly, Inocian et al. (2025) emphasized that experiential and simulation-based learning strengthens both conceptual understanding and practical disaster response skills, while Da Silva and Helnywati (2021) highlighted that project-based disaster education helps learners translate theoretical knowledge into real-life emergency actions. In contrast, Cordon and Polong (2020) argued that traditional rote instruction is insufficient in developing practical disaster preparedness skills due to limited experiential engagement. The findings suggest that PjBL provided a learner-centered and contextualized learning experience that significantly improved students' disaster preparedness by bridging the gap between theoretical knowledge and real-world application in earthquake situations.

In summary, the results revealed statistically significant improvements in both scientific literacy and disaster preparedness among Grade 7 students after the implementation of Project-Based Learning (PjBL), indicating that inquiry-based, collaborative, and experiential learning activities enhanced students' conceptual understanding and practical application of earthquake-related concepts. These findings support the studies of Almulla (2020), Wardah et al. (2022), and Kartini et al. (2021), which emphasized that PjBL improves scientific literacy through meaningful and authentic learning experiences. Similarly, the findings align with Libayao et al. (2024) and Inocian et al. (2025), who reported that project-based and experiential approaches strengthen disaster preparedness and response skills among learners. Overall, the study demonstrated that Project-Based Learning was effective in enhancing both the scientific literacy and disaster preparedness of Grade 7 students by promoting meaningful learning, critical thinking, and the practical application of earthquake preparedness concepts in real-life situations.

3.4. Proposed Project-Based Learning Instructional Materials Integrating DRRM Concepts in Grade 7 Science Lessons

In response to the significant gains in scientific literacy and disaster preparedness, a set of Project-Based Learning (PjBL) instructional materials integrating Disaster Risk Reduction and Management (DRRM) concepts was developed for Grade 7 Science, focusing on earthquake-related lessons. The development was grounded on the study's findings, which showed significant improvements in scientific literacy ($t(35) = 5.18$, $p < .001$, $d = 0.863$) and disaster preparedness ($t(35) = 5.15$, $p < .001$, $d = 0.858$), indicating that learners benefited from structured, inquiry-based, collaborative, and experiential learning activities. Thus, the instructional materials were designed to further strengthen conceptual understanding and the practical application of earthquake preparedness through authentic learning experiences. The proposed package consisted of four integrated PjBL modules aligned with Grade 7 Science competencies and DRRM principles, namely: Earthquake Hazard Mapping Project, School Emergency Preparedness Plan Development, Earthquake Simulation and Response Drill Project, and Community Awareness Campaign on Earthquake Safety. Overall, the instructional materials provided a learner-centered framework that integrates science and DRRM, aiming to enhance scientific literacy, improve disaster preparedness, and promote responsible citizenship among Grade 7 students through inquiry, collaboration, and real-world application.

4. Conclusion

This study examined the effects of Project-Based Learning (PjBL) on the scientific literacy and disaster preparedness of Grade 7 students in earthquake-related science instruction using a quasi-experimental one-group pretest–posttest design involving 36 Grade 7 students. Anchored on Constructivist Theory and Experiential Learning Theory, the study found that Project-Based Learning significantly improved students' scientific literacy and disaster preparedness. In response to the first research question, the mean Scientific Literacy Test score increased from 6.56 (SD = 1.90), interpreted as low scientific literacy, to 12.06 (SD = 5.51), interpreted as moderate scientific literacy after the intervention. For the second research question, the mean Disaster Preparedness Questionnaire score increased from 55.4 (SD = 14.7), interpreted as low disaster preparedness, to 94.1 (SD = 36.3), interpreted as moderate disaster preparedness following the implementation of PjBL. In response to the third research question, the study revealed a statistically significant difference between the pretest and posttest scores in both scientific literacy, $t(35) = 5.18$, $p < .001$, $d = 0.863$, and disaster preparedness, $t(35) = 5.15$, $p < .001$, $d = 0.858$, indicating large effect sizes and confirming the effectiveness of Project-Based Learning in improving students' learning outcomes. Finally, in response to the fourth research question, the findings served as the basis for the development of Project-Based Learning instructional materials integrating Disaster Risk Reduction and Management (DRRM) concepts into Grade 7 Science lessons through activities such as hazard mapping, earthquake simulations, fault identification, disaster risk analysis, and emergency response planning. Overall, the study concludes that Project-Based Learning is an effective instructional approach for enhancing scientific literacy and disaster preparedness among Grade 7 students and supports the integration of contextualized and experiential DRRM-based instruction in science education.

5. Recommendations

Based on the findings and conclusions of the study, several recommendations are proposed to strengthen the implementation of Project-Based Learning (PjBL) in science education, particularly in enhancing students' scientific literacy and disaster preparedness in earthquake-related topics. Science teachers are encouraged to integrate Project-Based Learning activities into earthquake and disaster-related lessons to improve learners' scientific understanding and preparedness competencies through meaningful and experiential learning experiences. School administrators may support professional development programs and training workshops that equip teachers with the knowledge and skills necessary to implement learner-centered and inquiry-based instructional strategies effectively. Curriculum developers are likewise encouraged to strengthen the integration of contextualized Disaster Risk Reduction and Management (DRRM) concepts and disaster preparedness education within the science curriculum to ensure relevance to real-world situations. Schools may also conduct regular disaster preparedness activities, simulations, and collaborative projects that allow students to apply scientific concepts in authentic disaster scenarios. Furthermore, future researchers are encouraged to conduct similar studies using larger sample sizes, control groups, and longer intervention periods to further validate and expand the findings of the present study.

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Artificial Intelligence (AI) tools were used solely for language refinement, grammar checking, formatting assistance, paraphrasing, and improving the clarity and coherence of the manuscript. Their use was strictly limited to editorial and technical support, while all data collection, analysis, interpretation, and formulation of findings, conclusions, and recommendations were independently conducted by the researcher. The researcher ensured compliance with academic integrity and ethical standards, confirming that AI was not used to generate data or research results; thus, full responsibility for the originality and validity of the study remains with the researcher.

About the Author

Blessie Nerza is currently pursuing a Master of Arts in Education major in Science at Leyte Normal University and holds a Bachelor's degree in Secondary Education major in Science. The author is interested in science education, Project-Based Learning (PjBL), disaster preparedness, and scientific literacy, with a focus on learner-centered and inquiry-based teaching strategies. The author advocates for experiential learning and the integration of Disaster Risk Reduction and Management (DRRM) in science instruction to develop critical thinking, engagement, and resilience among learners, and aims to contribute to the improvement of science education through innovative and evidence-based practices.

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