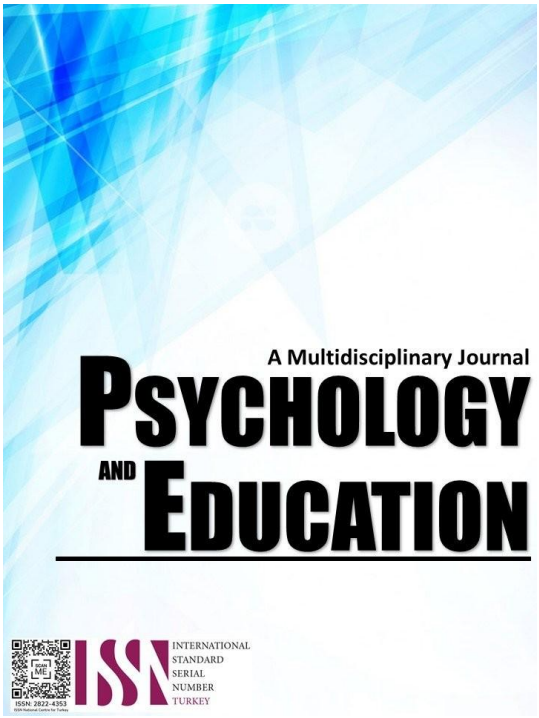
ENHANCING THE INTEGRATION OF DRRM EDUCATION IN THE CURRICULUM: A FRAMEWORK FOR DISASTER-RESILIENT SCHOOLS



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Research Article

Enhancing the Integration of DRRM Education in the Curriculum: A Framework for Disaster-Resilient Schools

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Abstract

Disaster Risk Reduction and Management (DRRM) education is increasingly recognized as essential in cultivating disaster-resilient school communities, particularly in disaster-prone regions such as the Philippines. This study examines the current status, challenges, and opportunities of integrating DRRM concepts within the basic education curriculum of public schools in Argao, Cebu. Employing a mixed-methods approach, the research encompassed curriculum analysis, surveys of 100 teachers, and interviews with school heads to assess instructional resources, teacher preparedness, and school-community collaboration. The findings reveal significant gaps: most teachers lack DRRM-specific training, instructional materials and experiential learning resources are insufficient, and school-community partnerships remain inconsistent. Despite policy support from the Department of Education and alignment with international frameworks like the Sendai Framework for Disaster Risk Reduction and UNESCO's Education for Sustainable Development, DRRM education is often fragmented, reactive, and marginalized within existing curricula. However, there is high willingness among educators to enhance their capacity, provided targeted training and localized educational resources are made available. To address these gaps, this study proposes a comprehensive DRRM integration framework anchored on a whole-school approach, interdisciplinary curriculum infusion, development of contextually relevant instructional materials, and strengthened school-community partnerships. The framework emphasizes continuous teacher professional development, policy support, and the institutionalization of DRRM as an enduring aspect of educational practice. By bridging policy and practice, the research offers actionable recommendations to empower educators and students with the knowledge, skills, and proactive mindset necessary for disaster risk reduction. This work contributes to educational reform for safer, more resilient school environments and provides a model adaptable to other disaster-prone, resource-constrained contexts.

Keywords: *curriculum integration, Disaster Risk Reduction, DRRM education framework, teacher preparedness, school-community partnerships*

Introduction

Disaster Risk Reduction and Management (DRRM) has become a global priority in education, especially in disaster-prone areas like the Philippines, where the impacts of natural hazards are often severe. The World Risk Index (2021) consistently places the Philippines among the most disaster-vulnerable nations attributed to its geographic location within the Pacific Ring of Fire and typhoon belt, making it susceptible to typhoons, earthquakes, and flooding, threatening communities and infrastructure. These disasters significantly disrupt the education sector, resulting in extended school closures, damage to educational facilities, and increased safety concerns for students and teachers alike (Hebeci, 2023). The impact of these disasters on educational institutions underscores the critical necessity for an effective and well-coordinated disaster preparedness strategy in the education sector. This approach ensures that students, educators, and communities acquire the vital knowledge and skills to minimize risks and respond effectively to emergencies.

Recognizing the significant role of education in fostering disaster preparedness and resilience, the Department of Education (DepEd) institutionalized DRRM education through DepEd Order No. 37, s. 2015, which mandates the integration of disaster preparedness concepts into the curriculum. This policy aligns with the United Nations Sustainable Development Goals (SDGs): SDG 4 (Quality Education), which highlights the need for inclusive and equitable education that equips learners with essential life skills; SDG 11 (Sustainable Cities and Communities), focusing on reducing disaster-related risks in communities; and SDG 13 (Climate Action), which emphasizes strengthening resilience and adaptive capacity to climate-related hazards (UNESCO, 2017; UNDRR, 2015; UNDRR, 2019). However, despite these policy efforts, DRRM education at the school level remains inconsistent, as numerous schools face challenges in implementing effective disaster preparedness strategies due to gaps in resources, teacher training, and community engagement.

While previous studies (Garcia & Cruz, 2020; Ramos et al., 2020) have examined the integration of DRRM education in urban and well-resourced schools, there remains a significant research gap regarding its implementation in rural, disaster-prone areas like Argao, Cebu. Rural schools face unique contextual challenges, including limited access to instructional materials, inadequate teacher training, and weak school-community collaboration, all of which hinder the effective delivery of DRRM education. A study by the Philippine Institute for Development Studies (2022) indicated that although DRRM policies exist, their implementation varies significantly, particularly in marginalized areas where teachers have limited professional development opportunities and schools struggle with resource constraints. The Municipality of Argao, Cebu, is among the areas frequently affected by extreme weather events, making DRRM integration in the curriculum a critical necessity. Schools in Argao serve not only as educational institutions but also as temporary evacuation centers, placing additional demands on teachers to not only instruct students on disaster preparedness but also

actively contribute to community disaster response efforts. However, many educators in these community's report challenges accessing specialized DRRM training programs and contextualized learning resources, limiting their ability to effectively integrate disaster preparedness concepts into their lessons (Ramos et al., 2020). Without structured capacity-building initiatives, teachers struggle to translate DRRM policies into meaningful classroom practices, leaving students vulnerable and underprepared for disaster situations.

Additionally, while Education for Sustainable Development (ESD) provides a holistic approach to disaster preparedness by integrating environmental, social, and economic dimensions, limited research explores how ESD principles are applied in DRRM education in rural settings. Many existing DRRM initiatives remain reactive rather than proactive, focusing more on post-disaster response than long-term preparedness and sustainability education (UNESCO, 2020). This reactive approach highlights a crucial gap in how DRRM education is delivered, emphasizing the need for a more structured, proactive strategy that goes beyond theoretical instruction to equip students with practical disaster preparedness skills. Effective integration of DRRM education should not only provide knowledge but also foster a culture of resilience, environmental stewardship, and community-driven disaster mitigation strategies.

Research Questions

This study contributes to bridging the existing gaps in DRRM education by examining the knowledge levels, engagement practices, and instructional needs of public-school teachers in Argao. It aimed to provide an innovative framework that enhances DRRM curriculum integration, focusing on contextualized, sustainable, and evidence-based approaches tailored to rural school settings. Unlike previous studies, which primarily examined urban schools or general DRRM policies, this research specifically addresses the challenges of resource-constrained rural schools. By aligning with global best practices such as UNESCO's DRR education framework and the Sendai Framework for Disaster Risk Reduction, this study provides practical, data-driven recommendations to strengthen DRRM implementation in the education sector.

By identifying the challenges and opportunities in DRRM education, this research offers valuable insights into specific strategies that can effectively enhance curriculum integration. It ensures that students gain not only theoretical knowledge but also essential disaster preparedness competencies—enabling them to respond effectively to disasters and contribute to long-term community resilience.

1. What is the status of DRRM integration, awareness, knowledge, and engagement levels of public-school teachers?
2. What are the capacities of schools in integrating DRRM in the curriculum as to:
    2.1 instructional materials;
    2.2 capacity building and training programs; and
    2.3 school-community engagement?
3. What challenges and opportunities do schools face in promoting DRRM education?
4. What specific enhanced framework, aligned with the ESD-based DRRM framework, can be proposed to effectively improve the integration of DRRM education?

Methodology

Research Design

This study employed a descriptive and exploratory mixed-methods approach, integrating quantitative surveys and qualitative interviews to comprehensively analyze Disaster Risk Reduction and Management (DRRM) education in schools. This design is appropriate, given the nature of the research. The descriptive aspect seeks to systematically document the current state of DRRM education, including the availability of instructional materials, teacher training opportunities, and school-community engagement. At the same time, the exploratory component seeks to uncover underlying challenges, instructional gaps, capacity-building needs, and community engagement strategies that influence the effectiveness of DRRM integration in the curriculum.

A mixed-methods approach was chosen to balance statistical rigor with contextual depth. The quantitative data, collected through structured surveys, proves measurable trends in teacher knowledge levels, resource availability, and institutional preparedness. In contrast, qualitative data gathered via interviews provides reliable insights into educators' experiences, challenges, and best practices. This integration allows for a more holistic understanding of the complexities surrounding DRRM education, ensuring that findings are both empirically grounded and contextually relevant.

This study upholds research validity and reliability by ensuring credibility and transferability in qualitative findings while employing appropriate statistical measures to ensure reliability in quantitative data analysis.

Respondents

The study participants are 106 elementary and secondary teachers and school heads of Argao, focusing on 100 teachers and 6 school administrators from DepEd Argao 1 and 2 Districts. Using a purposive sampling technique, participants were determined based on specific criteria aligned with the objectives of the study, such as being both a resident and teacher assigned in Argao and familiarity with DRRM education. Inclusion criteria included that participants actively teach for at least 3 years and have experienced integrating DRRM concepts in their lessons. Exclusion criteria were newly hired teachers and those without prior engagement with DRRM practices. The sample size was determined by the participant availability, number of schools, and logistical constraints. Teachers offered

insights into curriculum integration effectiveness, engagement practices, resource needs, and capacity-building gaps. School heads were also invited for qualitative interviews to gain institutional insights and perspectives on policy implementation, challenges, and strategies to effectively improve DRRM education. Purposive sampling ensured that participants could meaningfully contribute to understanding DRRM education.

This study shows over half of the teachers studied were between the ages of 30-39 years old (54%) and had 3-10 years of experience as a teacher (49%), indicating mid-career teachers as most of the workforce, indicating that they likely have substantial professional experience, which could influence their perspectives on DRRM education. According to Smith (2020), mid-career professionals often bring a balance of practical experience and openness to innovative practices, making them valuable in implementing education programs. Although the experience enhances professional growth, a good number (57%) have never attended training on DRRM, which shows a serious gap in professional development.

Instrument

The research instruments in this study were designed to collect both qualitative and quantitative data for a comprehensive assessment of Disaster Risk Reduction and Management (DRRM) education integration. The primary tools included a structured survey questionnaire and a semi-structured interview guide. The survey questionnaire was administered to elementary and secondary school teachers, to assess their knowledge, engagement, needs, capacity-building experiences, school-community engagement practices in DRRM education. The survey comprised both closed-ended questions to measure familiarity, participation, and resource access and open-ended questions to elicit in-depth insight into educational needs and techniques for community engagement. Semi-structured interviews with educators have provided qualitative data on their experiences, perceived challenges, opportunities and enhancement strategies concerning DRRM curriculum integration. This flexible format allowed for more in-depth exploration of curriculum integration, resource availability, and effectiveness in professional development programs, and significant concerns in school-community engagements. The survey questionnaire and interview guide underwent content and face validation with an Aiken's V value of 0.91 from three experts. A pilot test yielded a Cronbach's alpha of 0.86, confirming reliability and validity. The collected data informed the development of localized and effective environmental education strategies, strengthening environmental stewardship within the community.

Procedure

The data collection process involved both survey distribution and key informant interviews to ensure a well-rounded understanding of the research topic. The survey questionnaire was disseminated through online formats, primarily via Google Forms, to efficiently reach the selected respondents while ensuring accessibility and convenience. This approach allowed for the systematic collection of quantitative data from a broader sample. Meanwhile, key informant interviews were conducted with teachers and school heads to gain deeper insights into their perspectives. Each interview session was carefully recorded, transcribed, and analyzed thematically to identify recurring patterns, emerging themes, and significant narratives that contribute to the study's findings. This dual-method approach ensured a comprehensive data-gathering process, integrating both statistical trends and qualitative depth to strengthen the research outcomes.

Data Analysis

After the data was collected, it was systematically analyzed to derive meaningful insights that directly addressed the research objectives. A mixed-methods approach was employed, integrating both quantitative and qualitative analyses to ensure a comprehensive understanding of Disaster Risk Reduction and Management (DRRM) education integration. This approach facilitated a deeper examination of numerical data alongside descriptive participant insights, allowing for a more nuanced interpretation of findings.

The quantitative data from the structured survey questionnaire was analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations. These statistical measures were used to summarize respondents' DRRM knowledge levels, engagement in DRRM-related activities, access to instructional materials, capacity-building experiences, and school-community collaboration efforts. The results provided an overview of trends, common challenges, and resource gaps among educators integrating DRRM into their curriculum.

For the qualitative component, responses from open-ended survey questions and interview transcripts were subjected to thematic analysis (Braun & Clarke, 2006). This method involved identifying, coding, and categorizing recurring themes related to the barriers and opportunities for effective DRRM integration. Key themes that emerged included concerns, issues and gaps in institutional support, instructional materials and resources, DRRM trainings, school-community collaboration, opportunities described by teachers' and stakeholders' willingness, and strategies for enhancing DRRM integration. To ensure accuracy and consistency, data coding was conducted iteratively, refining categories based on emerging patterns.

To enhance the validity and reliability of the findings, data triangulation was employed. This process involved cross-referencing quantitative survey results with qualitative interview insights to identify converging patterns or discrepancies. By comparing multiple data sources, the study ensured a robust and well-rounded analysis, reducing biases and enhancing the credibility of conclusions drawn. Furthermore, inter-coder reliability was established by involving independent reviewers in coding qualitative data, ensuring consistency

in theme identification.

The combined analysis of quantitative and qualitative data provided a holistic understanding of the current state of DRRM education integration. The insights derived informed actionable recommendations for strengthening DRRM instructional practices, enhancing teacher training programs, and fostering stronger school-community partnerships to build disaster-resilient educational environments.

Ethical Considerations

To uphold ethical research standards, several measures were carefully implemented. First, participants were fully informed about the study's objectives, methods, and their voluntary involvement. Consent was collected to document their willingness to participate (Creswell, 2018). Confidentiality and anonymity were also prioritized by anonymizing personal identifiers and securely storing all data to protect participants' privacy (Bell & Waters, 2018). The principle of non-maleficence was strictly observed, ensuring that no psychological or professional harm was inflicted. Sensitive discussions, particularly those involving past disaster experiences, were handled with care and empathy (Orb, Eisenhauer, & Wynaden, 2004). Additionally, the study adhered to the ethical guidelines set by the institutional research ethics board and complied with the DepEd research protocol (Department of Education, 2017). By integrating these ethical considerations, the research offers a thorough analysis of DRRM education in Argao, providing valuable insights for enhancing lesson delivery, teacher training, and community engagement.

Results and Discussion

This section presents a comprehensive analysis of the quantitative and qualitative data collected, providing insights into the current status, challenges, opportunities, and proposed strategies for integrating Disaster Risk Reduction and Management (DRRM) education into the curriculum of schools in Argao, Cebu. The findings are organized around key aspects of DRRM education, including instructional frequency, teacher familiarity and knowledge, collaborative efforts, and resource availability, culminating in a discussion of perceived challenges and opportunities.

Table 1. *Frequency of Integration of DRRM Education in Classroom Instruction*

Response	*(f)*	*(%)*
Always	10	10.00%
Sometimes	60	60.00%
Rarely	17	17.00%
Never	13	13.00%
Total	100	100.00%

Legend: 76% – 100% → Always, 51% – 75% → Sometimes, 26% – 50% → Rarely, 0% – 25% → Never

Table 1 illustrates the reported frequency with which teachers integrate Disaster Risk Reduction and Management (DRRM) education into their classroom instruction. The data indicates that a significant majority of teachers (60.00%) integrate DRRM concepts "Sometimes," followed by those who do so "Rarely" (17.00%) and "Never" (13.00%). Only a small proportion of teachers (10.00%) consistently integrate DRRM education, reporting "Always." This distribution suggests that while DRRM education is present in the curriculum, its integration is often inconsistent and not fully institutionalized within daily lessons. This finding aligns with previous research highlighting a policy-to-practice gap in DRRM education, particularly in resource-constrained contexts. Despite national policies, such as the Department of Education Order No. 37, s. 2015, which mandates DRRM integration, actual implementation at the school level often remains inconsistent (UNDRR, 2019). The sporadic nature of integration observed in Argao, Cebu, may be attributed to a lack of structured curriculum requirements, limited dedicated teaching materials, and existing time constraints within the overloaded basic education curriculum (Shiwaku & Shaw, 2018).

The low percentage of teachers who "Always" integrate DRRM education suggests that it may not yet be viewed as a core or embedded component of regular instruction. This lack of consistent integration can hinder the continuous reinforcement of disaster preparedness knowledge and skills necessary for students to develop a proactive mindset toward disaster risk reduction. As Benson and Bugge (2021) emphasize, effective disaster preparedness education requires sustained effort and integration into the core curriculum to build resilience effectively. The findings underscore the need for stronger institutional support, clearer curricular mandates, and accessible educational resources to move DRRM education from occasional practice to consistent, embedded instruction.

Table 1. *Familiarity and Awareness of DRRM Concepts*

Response	*(f)*	*(%)*
Very Familiar	20	20.00%
Somewhat Familiar	49	49.00%
Low	27	27.00%
Very Low	4	4.00%
Total	100	100.00%

Legend:76% – 100% → Very Familiar, 51% – 75% → Somewhat Familiar, 26% – 50% → Low, 0% – 25% → Very Low

The results in Table 2 demonstrate that most teachers are only "Somewhat Familiar" (49%) or "Low" (27%) in their familiarity and awareness of DRRM concepts, while only a small portion are "Very Familiar" (20%) and "Very Low" (4%). This distribution suggests that although a considerable number of teachers are aware of DRRM principles, an even greater proportion lacks high-level familiarity and confidence with the subject matter.

This finding is consistent with previous studies showing that teacher familiarity with disaster risk reduction is often not at an optimal level for consistent and effective classroom integration, especially in developing or disaster-prone regions where specialized training or professional development in DRRM is limited. For instance, Ismail and Sahin (2025) found that teachers in many countries tend to have only moderate to low familiarity with DRRM concepts, which directly impacts the depth, quality, and regularity of disaster education implemented in schools. Similarly, UNESCO reports have emphasized the need for targeted capacity building and professional development for teachers to improve not just their awareness, but also their ability to integrate DRRM into everyday teaching.

Numerous researchers highlight that increasing teachers' familiarity with DRRM through continuous professional training, curriculum support, and the provision of practical resources is vital to nurturing a disaster-resilient school culture and to empowering teachers to confidently educate students about risk, safety, and preparedness.

Table 3. *Knowledge Levels on DRRM Topics*

Indicator	*Mean ($\bar{X}$)*	*Standard Deviation (s)*	*Description*
Disaster Prevention and Mitigation	3.21	0.85	Moderate Knowledge
Risk Assessment and Reduction Strategies	3.15	0.82	Moderate Knowledge
Disaster Preparedness and Contingency Planning	3.33	0.78	High Knowledge
Emergency Response	3.18	0.81	Moderate Knowledge
Stress Debriefing and Psychological First Aid	2.94	0.87	Moderate Knowledge
Climate Change Adaptation Mechanisms	3.11	0.83	Moderate Knowledge

Legend:3.50 – 4.00 → Very High Knowledge, 2.50 – 3.49 → Moderate Knowledge, 1.50 – 2.49 → Low Knowledge, 1.00 – 1.49 → Very Low Knowledge

The data in the Table 3 discusses the respondents' self-assessed knowledge levels across various DRRM topics. Teachers had the highest knowledge scores for disaster preparedness and contingency planning (Mean = 3.33, SD = 0.78), even though their knowledge of stress debriefing and psychological first aid (Mean = 2.94, SD = 0.87), and climate change adaptation mechanisms (CCAM) (Mean = 3.11, SD = 0.83) remained limited, as reflected. Enhancing training initiatives focused on CCAM and mental health preparedness and adaptive strategies is crucial to addressing these gaps. Previous studies (Shaw et al., 2016; UNDRR, 2020) suggest that psychological first aid is a necessary but frequently omitted aspect of disaster education. The low awareness of school educators indicates an urgent need for integrating mental health and psychosocial support strategies within DRRM training programs. This can help improve the quality of disaster preparedness education for students and positively influence the surrounding community by preparing teachers with these skills.

Table 4. *Collaboration with LGUs and/or Organizations for DRRM Activities*

Response	*Frequency (f)*	*Percentage (%)*
Yes	32	32.00%
Occasionally	50	50.00%
No	18	18.00%
Total	100	100.00%

It reveals that while 32% of respondents actively collaborate with local government units (LGUs) and organizations for disaster risk reduction and management (DRRM) activities, 50% engage only occasionally, and 18% do not participate at all. This indicates that some of those partnerships exist but are not fully in place or consistently applied. This sporadic nature of the collaborative aspect of DRRM initiatives suggests that they are often reflexive rather than progressive. Amri et al. (2018) highlight the importance of long-term, organized collaboration in building disaster resilience. The results are consistent with those in Twigg (2015), where he highlighted the importance of community partnerships to disaster preparedness. The urgency of this issue cannot be overstated. Nevertheless, as this analysis indicates, collaboration is limited and haphazard, underscoring the need for policy interventions that facilitate and institutionalize ongoing participation by schools and disaster management organizations. Limited collaboration may hinder the effectiveness of school-based DRRM efforts, as external agencies provide crucial expertise in areas such as risk assessment and mitigation, resources like emergency supplies and equipment, and logistical support for evacuation and response (UNDRR, 2020). Strengthening partnerships with LGUs, non-governmental organizations (NGOs), and disaster response agencies can enhance the implementation of localized DRRM programs tailored to community-specific risks. Formal agreements, such as memoranda of agreement (MOA) or memoranda of understanding (MOU), can help institutionalize these collaborations, ensuring continuity and long-term engagement. Furthermore, schools have critical roles in community-based disaster preparedness (Shiwaku & Shaw, 2016). Encouraging more structured engagement between schools and local DRRM bodies can lead to improved disaster awareness, capacity-building programs, and resource-sharing initiatives. This strategy would empower schools to become active contributors to local DRRM strategies rather than just beneficiaries, thereby enhancing the overall disaster preparedness of the community.

Table 5. *Instructional Materials and Resources*

Aspect	*Indicators*	*Frequency (f)*	*Rank*
Sufficiency of Current DRRM Instructional Materials	Yes	34	2
	No	66	1
Types of Instructional Materials Used	Textbooks	72	3
	Online Materials	79	2
	Visual Aids	54	4
	Videos	81	1
	Simulation Tools	14	5
Types of Learning Materials Needed	Visual Aids and Posters on DRRM Education	77	1
	Contextualized Modules on DRRM Education	50	5
	Lesson Exemplars Aligned with K to 12 Curriculum	63	3
	Storybooks with Local Practices for Disaster Management	54	4
	Digital and Online Learning Resources	65	2
Preferred Language for Instructional Materials	English	78	1
	Filipino	4	3
	Cebuano	18	2

Based on the data presented in Table 5, only 34% reported sufficient instructional materials, while majority (66%) reported insufficiency, indicating a gap in available disaster risk reduction education resources. In their study, Gaillard and Mercer (2013) note the importance of DRRM teaching resources being localized and/or free for communities to strengthen community resilience.

Regarding the types of instructional materials currently used, videos ranked highest (frequency 81), closely followed by online materials (frequency of 79) and textbooks (frequency of 72). Everyone prefers multimedia and digital resources over traditional methods, which indicates a shift toward more engaging and interactive approaches to DRRM education (Benson & Bugge, 2021) and stresses the importance of technology-driven learning tools. Very few respondents (frequency of 14) utilized simulation tools, which limits access to hands-on, experiential learning activities that develop disaster preparedness skills. Educators also strongly needed supplementary learning materials, with visual aids and posters (frequency of 77) and digital/online learning resources (frequency of 65) ranking as top priorities. The demand for lesson exemplars (frequency of 63) and contextualized DRRM modules (frequency of 50) reflects the need for structured, ready-to-use instructional guides aligned with the K to 12 curricula. Additionally, most respondents prefer storybooks incorporating local disaster management practices (frequency of 54), which highlights the value of culturally relevant narratives in promoting disaster awareness in support of the findings of Rahman et al. (2020).

In terms of language preferences, English emerged as the most preferred medium (78%), followed by Cebuano (18%) and Filipino (4%). It indicates that, while English remains the primary language of instructional materials, a sizeable chunk of respondents is cognizant of the significance of local language content to better help students connect with the material. Using multilingual disaster risk reduction and management (DRRM) resources will help bridge communication gaps and make disaster education more accessible to diverse learners (UNESCO, 2018).

The results have highlighted an immediate call for both technology-based localized DRRM instructional materials development and distribution, which is culturally and linguistically relevant to the learners. They must coordinate with local government units (LGUs) and disaster management agencies to produce contextualized modules and simulation-based learning tools. Furthermore, teacher training programs must include DRRM application procedures, ensuring ways of using different educational sources and ensuring disaster education will be enjoyable and practical for the learners.

Table 6. *Capacity Building and Professional Development for Teachers*

Aspect	*Indicators*	*Frequency (f)*	*Rank (%)*
Participation in DRRM training	Yes	43	29.00%
	No	57	71.00%
Willingness to Participate DRRM Trainings	Yes	100	1
	No	0	2
Types of Training Needed	Capacity Building Modules	66	1
	Aligning DRRM with K to 12	44	4
	Digital Tools & Gamification	45	3
	Experiential Learning Activities	53	2
	Localized Storybooks	37	5

The data shows that while all respondents (100%) expressed willingness to participate in DRRM training, only 43% had previous training experience, leaving a significant 57% without formal exposure. This gap in professional development may limit teachers' ability to effectively integrate DRRM concepts into instruction, reinforcing the need for targeted capacity-building efforts. According to the Hyogo Framework for Action (UNISDR, 2015), equipping educators with disaster preparedness skills is crucial for fostering

resilience among students and communities.

The respondents identified capacity-building modules (66) as their top training need, followed by experiential learning activities (53), digital tools and gamification (45), aligning DRRM with the K to 12 curriculum (44), and localized storybooks (37). The strong preference for capacity-building modules highlights the demand for structured programs that comprehensively cover disaster preparedness, risk mitigation, and emergency response. Experiential learning activities rank second, underscoring the importance of hands-on, real-world applications in DRRM education. This aligns with Kolb's Experiential Learning Theory (1984), which emphasizes active participation in learning experiences to enhance retention and application.

The growing interest in digital tools and gamification reflects the shift towards technology-enhanced learning, as interactive approaches improve engagement and knowledge retention (Deterding et al., 2011). Additionally, the need to align DRRM training with the K to 12 curriculum suggests that educators seek more precise guidelines on seamlessly integrating disaster education into existing lessons. Lastly, the demand for localized storybooks underscores the importance of culturally relevant materials in making DRRM concepts more accessible and meaningful, echoing Cummins' (2017) assertion that linguistic and cultural contexts play a vital role in effective education.

These findings emphasize the urgent need for expanded DRRM training opportunities. Education stakeholders must invest in structured capacity-building initiatives to ensure all teachers receive adequate preparation. Additionally, integrating experiential learning and gamified digital tools can make training more engaging and effective. Curriculum developers should work towards embedding DRRM education into the K to 12 frameworks, ensuring it is systematically addressed in schools. Lastly, developing localized instructional materials should be prioritized to enhance comprehension and applicability in diverse educational settings. Strengthening teacher training in DRRM is a critical step toward fostering a culture of safety and resilience within schools and the broader community.

Challenges, Opportunities, and Strategies for Enhancing DRRM Integration

This part presents the challenges, opportunities and enhancement strategies perceived by teachers and school heads to integrate DRRM concepts into the curriculum effectively.

Table 7. *Perceived Challenges*

Theme	*Sub-themes (Frequency)*	*Sample Vignettes (Participant Code & Position)*
Institutional Support	Lack of institutional support (14); Lack of funding and resources (8)	"While DRRM is important, there is no clear directive on how to integrate it into daily lessons." (P-09, School Head)
	Time constraints in curriculum integration (12)	"We have to cover a lot of topics in a short period, and DRRM is not given enough priority." (P-07, Teacher)
Instructional Materials & Resources	Insufficient DRRM instructional materials (15)	"There is a lack of locally developed materials specific to DRRM. Most of what we use are general science textbooks with minimal disaster-related content." (P-03, Teacher)
	Preference for multimedia and ICT-based resources (12)	"Students engage more when we use videos, online resources, and gamified learning tools for DRRM concepts." (P-10, Teacher)
	Need for ready-made lesson exemplars with DRRM integration (10)	"Teachers would benefit from structured lesson exemplars that integrate DRRM concepts with other subject areas." (P-08, Teacher)
	Need for contextualized and localized materials (10)	"Our learners relate more when materials are written in Cebuano and contain real disaster experiences from local communities." (P-07, Teacher)
Capacity-Building Initiatives	Limited teacher training in DRRM (14)	"I have not attended formal training on DRRM education. We just integrate what we know from general knowledge." (P-08, Teacher)
	No formal training opportunities for teachers (8)	"I have not received specialized DRRM training to effectively teach it (DRRM education) to students, that I rely only on my personal knowledge." (P-02, Teacher)
	Need for experiential and hands-on learning (12)	"Workshops with real-life simulations will help teachers and students understand how to respond effectively." (P-05, School Head)
	Alignment of DRRM training with K to 12 curriculum (9)	"We need seminars and trainings that align DRRM with the subjects we already teach, like Science and GMRC." (P-14, Teacher)
School-Community Collaboration Strategies	Lack of formal partnerships with LGUs and DRRM organizations (12)	"We need stronger collaboration with the barangay and other agencies for disaster education and preparedness drills." (P-06, School Head)

The effective integration of Disaster Risk Reduction and Management (DRRM) concepts in school curricula faces significant challenges as presented in Table 9. A predominant challenge is the lack of institutional support and funding, which leaves schools without clear directives or structured policies for embedding DRRM concepts into the curriculum (P-09, School Head). DRRM

education remains a low priority if without strong institutional support, resulting in fragmented and inconsistent implementation. This finding aligns with Gaillard and Mercer (2013), which states that institutional commitment is essential for the sustainability of DRRM initiatives in education. The absence of financial support further intensifies this issue, limiting teachers' acquisition of instructional resources and professional development opportunities.

Another challenge noted is time constraints which also significantly hinder efforts to integrate DRRM-related concepts into the lesson considering the overwhelming learning competencies per learning area (P-07, Teacher). Teachers strive to cover all mandated subjects within the school calendar, making it difficult for them to dedicate a reasonable amount of time to disaster education integration in their lessons. This reflects a greater challenge in education policy, where competing priorities often marginalize critical but non-core content areas like DRRM. As Shiwaku and Shaw (2018) suggest, the rigidity of existing curricular frameworks calls for more flexible models that accommodate disaster education without burdening teachers.

Moreover, the scarcity of DRRM-specific instructional materials is also a considerable challenge. Most available resources are generic science textbooks with minimal disaster-related content (P-03, Teacher), making it difficult for educators to provide engaging and contextually relevant lessons. Teachers expressed a strong preference for multimedia and ICT-based resources (P-10, Teacher), but these remain largely unavailable in many schools. Additionally, the lack of localized and contextualized materials hinders student engagement, as generic resources fail to capture the realities of disaster risks in specific communities (P-07, Teacher). This indicates a significant need in curriculum development; DRRM education risks becoming theoretical rather than practical without resources that represent local hazards and disaster experiences.

Another major barrier for integration is the lack of formal teacher training on DRRM. Many educators reported they never received specialized training on how to integrate DRRM concepts effectively, relying instead on personal knowledge (P-02, Teacher). This circumstance weakens the pedagogical quality and depth of DRRM education, reinforcing the need for systematic capacity-building programs. Without DRRM-related professional development initiatives, teachers remain not fully equipped on how to integrate DRRM into core subjects, ultimately diminishing the program's impact on student preparedness.

Lastly, school-community collaboration remains a priority improvement area, with inadequate linkages between schools, local government units (LGUs), and disaster response organizations. “We need stronger collaboration with the barangay and other agencies for disaster education and preparedness drills” (P-06, School Head). This lack of structured collaboration reduces opportunities for hands-on learning and weakens community-wide disaster resilience, as students miss the chance to engage with experts and firsthand experiences.

Overall, the findings reveal significant gaps in instructional resources, teacher training, and practical application of DRRM principles in classroom settings. Schools struggle with limited access to teaching materials, and teachers report a lack of professional development opportunities related to DRRM. Moreover, school-community collaboration remains inconsistent, affecting the practical implementation of disaster preparedness initiatives. These findings align with previous studies emphasizing the need for comprehensive DRRM education policies and more robust teacher training programs. Compared to global frameworks such as the Sendai Framework for Disaster Risk Reduction, current DRRM integration efforts in local curricula are insufficient in equipping learners with practical disaster-response skills.

After a detailed analysis of the challenges encountered by schools, the following section focuses on the specific opportunities for integrating DRRM into educational practices.

Table 8. *Opportunities for DRRM Integration*

Theme	*Sub-themes (Frequency)*	*Sample Vignettes (Participant Code & Position)*
Teachers’ Willingness	Willingness of teachers and schools to integrate DRRM education (12)	"I am open to incorporating DRRM concepts in my class if provided with proper guidance or given capacity trainings and of course materials." (P-13, Teacher) “Gamification, interactive videos, and digital simulation skills are helpful to improve student engagement and preparedness.” (P-15, Teacher).
School-Community Collaboration	Strong willingness of teachers and stakeholders to engage in DRRM (15)	"Most of us teachers and community members are willing to take part in DRRM-related activities, but there is no structured collaboration yet." (P-11, Teacher)
	Potential role of indigenous knowledge and local stories in DRRM education (5)	"Our community has traditional ways of predicting natural hazards. These should be part of DRRM lessons to be integrated." (P-12, Teacher)
	Community-based learning and partnerships (10)	"Barangay leaders and local agencies can provide first-hand knowledge and assist in conducting school-based disaster preparedness sessions." (P-05, School Head)

One of the most promising opportunities is the strong willingness among teachers and school administrators to integrate DRRM concepts into their subjects, provided they receive adequate guidance, training, and resources (P-13, Teacher). This suggests that there are no resistance issues among teachers about DRRM integration in their teaching. However, this can be addressed through targeted interventions such as curriculum redesign, instructional support, and teacher training, reassuring stakeholders about the potential

success of DRRM education. It's also vital for schools to invest in digital tools for DRRM education. Teachers have highlighted the potential of gamified lessons, interactive videos, and digital simulations to improve student engagement and preparedness (P-15, Teacher). Research by Selby and Kagawa (2012) reinforces this, demonstrating how technology-driven strategies enhance disaster education outcomes by making learning more experiential and interactive. This underscores the importance of schools integrating digital tools into DRRM instruction to maximize student engagement and retention.

Community-based learning and partnerships are a goldmine of untapped potential in DRRM education. Indigenous knowledge and local stories, such as traditional ways of predicting natural hazards, can offer culturally relevant and practical learning experiences (P-12, Teacher). Schools also can collaborate with LGUs and local agencies to facilitate disaster preparedness sessions, ensuring that students receive authentic, experience-based learning (P-05, School Head). Research by Shaw et al. (2011) further supports this approach, highlighting that localized, community-driven models significantly enhance disaster resilience in schools.

Strategies for Enhancing DRRM Integration

To overcome challenges and capitalize on opportunities, this study finds key strategies for enhancing Disaster Risk Reduction and Management (DRRM) integration in the curriculum.

Table 9. *Strategies for Enhancing DRRM Integration*

Theme	*Sub-themes (Frequency)*	*Sample Vignettes (Participant Code & Position)*
Instructional Materials Development	Development of localized instructional materials (14)	"For me, DRRM modules and storybooks that reflect our local disaster risks and preparedness practices are very helpful especially for my grade 3 pupils." (P-10, Teacher)
	Contextualizing learning materials based on community hazards (10)	"Much better if materials are readily provided like instructional resources should highlight real-life disaster scenarios from our locality to make lessons more relatable and meaningful." (P-12, Teacher)
Capacity Building Initiatives	Strengthening teacher capacity through training (12)	"I like workshops on integrating DRRM into my Science, Mathematics, GMRC class will really help." (P-14, Teacher)
	Integration of DRRM into experiential learning activities (10)	"I involve students in hazard mapping, contingency planning, and drills to make DRRM lessons more practical." (P-06, Teacher)
Curriculum Enhancement	Embedding DRRM concepts across subject areas (9)	"DRRM should not just be a one-time topic but a recurring theme across different subjects to build a culture of preparedness." (P-07, Teacher)
	Inclusion of DRRM in school-based programs and policies (7)	"Our school needs to establish clear policies and integrate DRRM in homeroom guidance and school activities." (P-11, School Head)
Community Engagement and Advocacy	Strengthening school-community partnerships (8)	"Parents and barangay officials should be involved in school DRRM initiatives to ensure a wider impact. They must be present as well during drills especially reunification." (P-05, Teacher)
	Formalizing partnerships with LGUs and DRRM organizations (8)	"Stronger collaboration with local authorities such us MDRRMO, Fire Department and other emergency response bodies enhance the implementation of DRRM activities in schools." (P-03, School Head)

Instructional Materials Development

As key advocates, school heads and teachers have identified the need for contextualized and localized DRRM modules and storybooks that emulate local disaster risks and preparedness practices (P-10, Teacher). Research by Amri et al. (2018) supports those contextualized materials enhance student comprehension, engagement, and retention. By anchoring DRRM lessons in real-life community experiences, students cultivate a stronger personal association to disaster preparedness. Additionally, contextualization enhances the relevance of DRRM education by incorporating specific hazards that students and their specific communities face (P-12, Teacher). Studies by Selby and Kagawa (2012) highlighted that locally relevant educational content fosters greater student participation and proactive engagement in disaster preparedness. Nonetheless, the use of interactive digital resources, such as videos, simulations, and gamified learning experiences, is also instrumental in deepening students' understanding of disaster preparedness (P-08, Teacher). Research by Lai & Bower (2019) underscores the effectiveness of technology-driven pedagogies such as gamification in strengthening student engagement and knowledge retention in DRRM education.

Capacity Building Initiatives

Implementing structured teacher training programs on DRRM integration is one of the key aspects of this study. Workshops on integrating DRRM into my Science, Mathematics GMRC class will help improve instruction and integrate DRR concepts (P-14, Teacher). It ensures educators are equipped with the content knowledge and pedagogical strategies necessary to effectively teach disaster preparedness. This aligns with the findings of Izadkhah and Hosseini (2005), who emphasize that continuous professional development is critical for the success of disaster education initiatives. By committing to regular DRRM trainings, schools can create a more confident and competent teaching force capable of delivering high-quality DRRM education incorporated in teaching core-

contents of the curriculum. School leaders' role in this continuous learning process is crucial.

On the other hand, to move beyond theoretical instruction, involving students in hazard mapping, contingency planning, and simulation drills to make DRRM lessons more practical (P-06, Teacher). Johnson et al. (2014) highlights that experiential learning is one of the most effective methods for developing practical disaster preparedness and response skills. This strategy ensures that students not only understand DRRM concepts but can also apply them in real-life emergency situations.

Curriculum Enhancement

DRRM should be an integral component of various subjects rather than a standalone topic. DRRM should not just be a one-time topic but a recurring theme across different subjects to build a culture of preparedness (P-07, Teacher). Studies by Shiwaku and Shaw (2015) emphasize that cross-curricular DRRM integration promotes a culture of preparedness by reinforcing disaster education in Science, Social Studies, Values Education, and other disciplines. Meanwhile, establishing school policies that incorporate DRRM within homeroom guidance, co-curricular activities, and student leadership programs ensures continuity and institutional commitment to disaster preparedness (P-11, School Head). According to Shaw et al. (2011), school-wide policies that integrate DRRM foster a proactive disaster-resilient culture.

Community Engagement and Advocacy

Strengthening school-community partnerships is a crucial aspect of DRRM education. Encouraging active collaboration between schools, parents, and barangay officials in DRRM initiatives fosters collective responsibility and enhances community-wide disaster resilience (P-05, Teacher). Aldrich and Meyer (2015) highlight that social capital plays a crucial role in effective disaster risk reduction, as strong community networks contribute to faster and more coordinated emergency responses. This involvement is key to our collective success in disaster risk reduction. In addition, schools can extend their impact beyond the classroom by organizing community-based DRRM awareness drives to educate not just the students but their parents as well (P-09, Teacher). Research by Paton & Johnson (2017) suggests that public education campaigns significantly influence household preparedness and encourage proactive disaster risk management behaviors. Furthermore, establishing structured collaborations between schools and local disaster response agencies provides students with direct exposure to real-world disaster management practices (P-03, School Head). Research by Ronan et al. (2010) underscores the significance of community engagement in strengthening school-based disaster preparedness, reinforcing the need for long-term, institutionalized partnerships. Strengthening these partnerships guarantees access to expert knowledge, emergency response resources, and coordinated disaster preparedness efforts.

Overall, the findings suggest that a multi-faceted approach is essential for effective DRRM integration in education. Schools must adopt localized, technology-enhanced, and experiential learning strategies to make disaster education more engaging and meaningful. Strengthening teacher competencies through continuous professional development, embedding DRRM across the curriculum, and fostering institutional and community collaborations are critical steps toward building a culture of preparedness and resilience. Policymakers and educational leaders should prioritize structured training programs, allocate resources for instructional material development, and institutionalize DRRM policies at the school and community levels. By implementing these strategies, schools can play a transformative role in developing disaster-resilient communities and ensuring the safety and preparedness of future generations.

Conclusion

This study comprehensively examined the integration of Disaster Risk Reduction and Management (DRRM) into the curriculum. Disaster Risk Reduction and Management education forms an integral part towards community-based disaster resilience, yet its implementation remains fragmented due to institutional, pedagogical, and community-related challenges. This study has identified significant gaps in DRRM education, including the lack of instructional materials, inadequate teacher training, time constraints in curriculum integration, and weak school and community collaboration efforts. However, the study highlights a strong willingness among educators to incorporate DRRM education, especially when provided with adequate training, DRRM content-specific instructional resources, and community support. The findings emphasize that DRRM education should not be treated as an integral component of the K to 12 curriculum. The results highlight that DRRM education can be enhanced through localized instructional materials, experiential learning strategies, structured capacity building initiatives, and stronger school-community partnerships. Moreover, technology-enhanced learning and multimedia tools were also identified as effective approaches in engaging students in disaster preparedness activities. The study further underscores the importance of collaborative efforts between schools, local government units (LGUs), non-governmental organizations (NGOs), and disaster risk reduction agencies in fostering a culture of preparedness and resilience among students, teachers, and the wider community.

This study extends the discourse on DRRM education by offering strategies for enhancing integration, aligning it with present pedagogical principles and national education policies. It bridges theoretical perspectives with practical applications. In this way, it contributes to a body of literature on disaster education and curriculum development. Additionally, its implications for educational policies are substantial, advocating for urgent and necessary curriculum reforms that institutionalize DRRM across various grade levels and subject areas. By providing empirical data and policy recommendations, this research supports educational stakeholders, including policymakers and curriculum developers, in formulating evidence-based strategies for a more resilient and disaster-ready education

system.

Future studies can establish a basis from this study by exploring longitudinal impacts of DRRM integration on student preparedness and community resilience. Additionally, comparative analyses between different curricular models and their effectiveness in diverse educational settings could further refine best practices in DRRM education. Investigating innovative teaching methodologies, such as technology-enhanced DRRM instruction and experiential learning approaches, can also contribute to a more robust and dynamic framework for disaster education. By advancing research in this domain, educators and policymakers can continue to develop more comprehensive, contextually relevant, and sustainable DRRM education programs that empower learners and communities to face adversities.

This study highlights the urgent need for a structured approach to integrating DRRM education into the curriculum.

Enhancing teacher training programs to improve DRRM knowledge and pedagogical approaches.

Developing comprehensive instructional materials aligned with national and global DRRM frameworks.

Strengthening school-community partnerships to facilitate experiential learning and practical disaster preparedness initiatives.

Incorporating interdisciplinary strategies to integrate DRRM education across various subjects.

Developing clear policies on DRRM integration and establish monitoring mechanisms to evaluate their effectiveness. Periodic assessments and feedback loops should be instituted to continuously improve DRRM education based on emerging challenges and best practices.

Future research should be conducted to evaluate the long-term effectiveness of DRRM integration in the curriculum, particularly in different educational settings such as in rural and urban school communities. Research should also explore innovative teaching methodologies, the impact of digital learning tools, and the role of socio-cultural factors in disaster preparedness.

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