

**Enhancing disaster preparedness and response in higher education:  
Basis for a P.E.-Integrated “Evacuate and Escape” Program**

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**ABSTRACT**

This study aimed to assess the impact of the Physical Education–Integrated Disaster Preparedness and Response Program on the disaster readiness of tertiary students. The program, implemented within the PATHFIT course at Jose Rizal University, combined physical disaster drills with reflective activities to improve students’ emergency response capabilities. Using a one-group pre-test and post-test design, the study evaluated students’ performance in disaster response drills before and after the program. The results showed significant improvements in students’ physical and cognitive preparedness, with post-test mean scores ranging from 4.33 to 4.45, compared to pre-test scores of 2.77 to 3.00, indicating substantial enhancement across all stages of experiential learning. Survey results on the program’s effectiveness showed that students rated the program highly for its clarity, realism, and contribution to their disaster readiness. The findings suggested that the program enhanced students’ physical readiness, decision-making, teamwork, and overall disaster response capabilities. Based on these results, it is recommended that the program be further integrated into the curriculum to strengthen disaster preparedness across academic institutions.

**Keywords:** Disaster preparedness, experiential learning, physical education, disaster response, tertiary students.

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**INTRODUCTION**

Higher education institutions in the Philippines have intensified efforts to build disaster readiness among students, especially as natural hazards continue to pose serious threats. The National Disaster Risk Reduction and Management Council (NDRRMC) has led initiatives emphasizing proactive planning, evacuation, and emergency response training for learners (NDRRMC, 2021). Simultaneously, the Commission on Higher Education’s (CHED) Memorandum Order No. 39, Series of 2021, mandates Physical Education (PATHFIT) courses that advance students’ physical resilience, movement competency, and overall wellness, elements that can directly support disaster preparedness training (CHED, 2021).

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These national efforts align closely with global priorities outlined in Sustainable Development Goal 11, which calls for inclusive, safe, resilient, and sustainable communities, particularly through reducing disaster risks in urban settings (United Nations, 2023). At the same time, SDG 4 promotes quality education by encouraging institutions to provide learners with the skills needed to promote sustainable development and risk awareness (Landa-Blanco, 2025). International studies have emphasized the integration of experiential, movement-based learning approaches in disaster education as essential for cultivating real-time readiness and enhancing community resilience (Bacus, 2025; Carrus et al., 2025). This shift reflects a growing recognition that disaster preparedness is not only a civic priority but also an educational responsibility. As universities adopt more practice-based frameworks aligned with both physical education and risk reduction, the potential for student engagement and institutional resilience significantly increases.

Despite the growing emphasis on disaster preparedness in higher education, Physical Education programs, particularly PATHFIT 1, continue to focus mainly on theoretical knowledge, with little emphasis on practical, real-life emergency applications. PATHFIT 1 aims to develop movement competency but often fails to connect these physical skills to real-world scenarios such as evacuation and escape. This disconnect presents a critical issue, as students may understand disaster response protocols in theory but remain physically unprepared to carry them out under pressure. Traditional drills, when conducted, are often isolated from the curriculum and lack the intensity and realism needed to develop effective response behaviors. As a result, students miss the opportunity to build the physical coordination, quick decision-making, and confidence required in actual emergencies. While policies exist to promote school-wide readiness, these efforts are frequently detached from the physical training students receive in PE classes. This reveals a significant gap where disaster education remains abstract, and movement education lacks practical context. By integrating realistic, movement-based disaster simulations into PATHFIT 1, students can develop not only physical fitness but also the readiness and presence of mind needed to respond effectively in crisis situations.

Current evidence indicates that although college students may demonstrate reasonable awareness of disaster protocols, their actual response behaviors, especially in contexts requiring physical coordination, remain underdeveloped. A study at the University of Mindanao found that demographic differences influence awareness and preparedness, but even in cases of “good” awareness levels, practical readiness was uneven (Potenciando et al., 2024). Another cross-sectional survey across Philippine colleges noted that while students understand safety protocols conceptually, they struggle with applying these measures under pressure (San Isidro College, 2025). This underlines a research gap: existing preparedness programs are largely theoretical and lack active, movement-based practice of evacuation and escape behaviors. Without such embodied training, students may remain cognitively aware but behaviorally unprepared during emergencies.

There is a significant opportunity to develop and assess a PE-integrated disaster preparedness program that directly addresses the gap between theoretical knowledge and physical readiness. At Jose Rizal University in Mandaluyong City, students enrolled in PATHFIT courses present an ideal group for implementing an obstacle course-based “Evacuate and Escape” program that enhances not only individual performance in disaster drills but also teamwork and situational awareness. This approach aligns with the need to evaluate students’ physical performance before and after the program, shedding light on its actual effectiveness in real-world scenarios. It also opens the door to understanding the practical challenges faced during implementation, offering insights into how such programs can be improved and sustained. PE instructors can transform their classes into platforms for both fitness and emergency training, while administrators can integrate these activities into

institutional safety strategies. On a larger scale, agencies like CHED and NDRRMC could explore the program as a replicable model for integrating disaster response into tertiary curricula across the country. With empirical evidence on performance gains and behavioral shifts, this initiative could inform national policy and educational standards. Ultimately, it fosters a generation of graduates who are not only physically fit but also capable of responding effectively and confidently in times of crisis.

This study offers meaningful contributions across educational, institutional, and policy levels. It generates empirical data on the effectiveness of integrating structured, simulation-based disaster preparedness drills into PATHFIT courses, bridging the gap between theoretical instruction and practical application. By aligning physical education with emergency readiness, it presents a curriculum innovation that PE departments nationwide can adapt to support CHED and NDRRMC goals. Conducted within the context of Jose Rizal University and focused on tertiary students, the study maintains high institutional relevance and feasibility for immediate implementation. The program's emphasis on physical performance, cognitive readiness, and cooperative action provides a comprehensive framework for disaster education. It also creates an evidence-based model that can inform future revisions of PE curricula and campus safety programs. Beyond the university, its findings contribute to broader discussions on strengthening community resilience through education. The study underscores how fitness instruction can be purposefully aligned with life-saving competencies, ultimately preparing students to act effectively in real emergencies.

## METHODOLOGY

### Project design

This study employed a quasi-experimental mixed-method design to determine the impact of a Physical Education–Integrated Disaster Preparedness and Response Program on the disaster readiness of tertiary students. The design was anchored on Kolb's Experiential Learning Theory, which explained learning as a continuous process of concrete experience, reflection, conceptual understanding, and active experimentation. This framework supported the study's focus on practical, experience-based learning through structured physical drills and reflective activities. The research followed a one-group pre-test and post-test design, assessing student performance in traditional disaster response drills before and after the implementation of the PE-integrated intervention. This approach provided measurable data on performance changes and allowed observation of how students applied learned responses after participating in the program, emphasizing both the physical and cognitive dimensions of learning as influenced by experiential engagement.

The quantitative aspect of the study measured the improvement in students' disaster response performance between pre-test and post-test results, enabling a comparison of their skill development and preparedness. The qualitative aspect collected data through guided reflections and focus group discussions conducted during and after the intervention. These methods captured students' personal experiences, difficulties, and insights regarding the program's relevance and practicality. Responses were examined through the lens of Kolb's learning stages, focusing on how reflection and conceptual understanding translated into applied readiness. The design assessed not only the measurable outcomes of the intervention but also the underlying learning processes and behavioral changes it fostered. Together, the pre- and post-assessments, reflective discussions, and observed performance improvements provided a complete understanding of how experiential methods enhanced disaster preparedness in higher education.

## Project development

The participants in this study were 40 officially enrolled college students taking PATHFIT at Jose Rizal University during the semester of implementation. These students were purposively selected since the course provided an appropriate platform for integrating physical education with disaster preparedness and response. The study utilized a one-group design where the same participants underwent both pre-test and post-test evaluations to measure the effect of the intervention. All participants took part in the PE-Integrated Disaster Preparedness and Response Program, which combined physical simulation and guided reflection activities. Selection considered factors such as academic level, age, and class section to maintain uniformity among participants. A total of 40 students was considered suitable for this classroom-based intervention, providing enough data to support both the quantitative and qualitative analyses of performance and experience.

Only students who completed both the pre-test and post-test drills were included in the final analysis to ensure accuracy and consistency in measuring outcomes. The intervention followed Kolb’s Experiential Learning Theory, allowing participants to learn through active drills, reflective sessions, conceptual understanding, and reapplication of skills. Throughout the program, attendance, task completion, and engagement were carefully monitored and documented. Students with prior professional disaster response training were excluded to maintain a consistent baseline of knowledge and ability. The study focused on assessing performance improvement and perceived effectiveness based on the same group’s experiences before and after the intervention. All ethical standards, including informed consent, voluntary participation, and data confidentiality, were strictly followed to ensure the integrity and safety of participants throughout the research process.

This study utilized both quantitative and qualitative instruments, aligned with its mixed-methods design and guided by the research questions and Kolb’s Experiential Learning Theory. For research questions 1 and 2, a traditional disaster response performance task was used to measure students’ baseline and post-intervention skills. This instrument simulated a complete evacuation and emergency response drill, serving as both a pre-test and post-test to evaluate improvements in preparedness. The task assessed observable behaviors such as timing, sequencing of actions, cooperation, and adherence to safety procedures during the simulated scenarios. The structure and content of this performance task were reviewed and validated by subject matter experts in Physical Education and Disaster Risk Reduction to ensure appropriateness, content validity, and alignment with real-world emergency protocols.

For research questions 3 and 4, qualitative data were gathered using a researcher-made Focus Group Discussion (FGD) guide, which included open-ended questions that explored students’ experiences, encountered challenges, and insights about the intervention. The FGD guide was designed to elicit reflections that corresponded to Kolb’s stages of reflective observation and abstract conceptualization, allowing the study to capture meaningful learner perspectives. To further support the analysis of research question 4 on perceived program effectiveness, a 5-point Likert scale instrument was also developed to quantify students’ evaluations of the program’s clarity, realism, usefulness, and overall impact. Both the FGD guide and the Likert scale tool underwent expert validation by professionals in educational research. This multi-instrument strategy ensured that both the measurable outcomes and the subjective learning experiences of students were adequately captured and analyzed within the experiential learning framework.

### Operation and testing procedure

The data collection process in this study followed the sequence of the research questions and the experiential learning cycle, beginning with exposure, moving through engagement, followed by evaluation, and ending in enhancement. Before engaging in any physical activities, participants were required to complete a Physical Activity Readiness Questionnaire (PAR-Q) to ensure their health and readiness for the exercises. After clearing the PAR-Q, all participants performed a traditional disaster response performance task that served as the pre-test to determine their baseline level of disaster preparedness. This drill simulated a complete disaster scenario involving evacuation, coordination, and decision-making in a timed environment. The instrument was validated by experts in physical education and disaster management to ensure accuracy, safety, and instructional relevance. The intervention was integrated into the PATHFIT course in accordance with CHED Memorandum Order (CMO) No. 39, Series of 2021, which promoted the inclusion of fitness, safety, and movement competency in tertiary Physical Education. The program was implemented for a total of 18 hours, conducted for three hours per week with flexible scheduling to prevent disruption of regular classes. Each session was supervised and documented, corresponding to Kolb's "concrete experience" and "active experimentation" stages.

After the completion of the integrated intervention, students retook the traditional disaster response performance task as a post-test to determine any improvement in their readiness and physical execution. To identify challenges encountered during implementation, focus group discussions (FGDs) were conducted using a validated researcher-made guide among selected participants. These sessions aligned with Kolb's "reflective observation" stage, encouraging participants to share their experiences, difficulties, and learning insights during the drills. A validated 5-point Likert scale questionnaire was also administered to measure students' perception of the program's effectiveness, representing Kolb's "abstract conceptualization" stage. This tool gathered structured feedback on the program's clarity, realism, applicability, and contribution to disaster readiness, using a scale ranging from 1 – Strongly Disagree to 5 – Strongly Agree. All data collected were securely stored, anonymized, and used solely for research purposes in accordance with institutional ethical standards.

### Project data analysis

The data analysis in this study was systematically aligned with the research questions, instruments, and phases of the intervention. For students' initial performance in traditional disaster drills, descriptive statistics such as mean and percentage were used to summarize baseline results, providing a clear picture of their preparedness prior to the implementation of the PE-Integrated Disaster Preparedness and Response Program. The same statistical treatment was applied to the 5-point Likert scale responses to assess students' perceptions of the program's clarity, realism, and effectiveness. All quantitative data were processed using SPSS software to ensure accuracy, reliability, and efficiency of results. The use of descriptive statistics allowed for the identification of patterns and trends related to students' preparedness and perceived learning outcomes. Quantitative results from the post-test were compared with pre-test data to measure improvement and determine the overall impact of the integrated intervention. This process provided numerical evidence of learning progress aligned with Kolb's stages of Concrete Experience and Active Experimentation.

To further assess students' performance before and after the intervention, a paired sample t-test was conducted through SPSS to determine if there was a statistically significant difference between the pre-test and post-test scores. This test was suitable since it compared

related scores from the same participants, providing insight into measurable skill enhancement. Meanwhile, Research Questions 3 and 4 were addressed through qualitative data gathered from focus group discussions, transcribed and analyzed using thematic coding. This qualitative approach identified recurring patterns, expressions, and insights that reflected students' experiences and perceptions throughout the learning cycle. Thematic findings were interpreted in relation to Kolb's Reflective Observation and Abstract Conceptualization stages to capture how students processed and internalized their experiences. Integrating quantitative and qualitative results provided a comprehensive understanding of both performance gains and behavioral transformation, allowing the study to evaluate not only the outcomes of the program but also the processes that contributed to effective disaster readiness.

### Evaluation procedure

The evaluation of the P.E.-Integrated Disaster Preparedness and Response Program was based on both quantitative and qualitative data gathered throughout the study. For Research Question 1, students' performance in executing traditional disaster drills was assessed using pre-test and post-test evaluations. These drills tested physical competencies like agility, coordination, and reaction time, forming the Concrete Experience stage of Kolb's model. The changes in students' performance were measured through descriptive statistics to capture improvements in physical disaster response. Additionally, for Research Question 2, the paired t-test was applied to assess whether there was a significant difference in students' pre-test and post-test results, indicating the impact of the intervention. This quantitative approach provided a clear comparison of performance before and after participation in the program.

For Research Questions 3 and 4, the qualitative component of the evaluation involved focus group discussions (FGD) and reflective feedback from participants, capturing insights into the challenges encountered during the program and its perceived effectiveness. These reflections allowed students to process their Concrete Experience and Reflective Observation, aligning with Kolb's stages of learning. Students were asked to share their personal challenges, teamwork experiences, and the skills they found most useful during the drills. Through thematic coding, the data were analyzed to identify recurring themes, which then informed the Abstract Conceptualization and Active Experimentation phases of the learning cycle. The insights gained from these discussions helped evaluate the program's effectiveness in enhancing disaster readiness, offering practical suggestions for future improvement and application.

## RESULTS AND DISCUSSION

The students' performance in traditional disaster drills before and after the P.E.-Integrated Program.

The pretest and posttest performance levels of students in executing traditional physical disaster drills following the implementation of the P.E.-Integrated Disaster Preparedness and Response Program. The data indicate a substantial improvement in students' performance across all indicators after the intervention. Prior to the implementation of the program, students demonstrated moderate performance levels across the four components of the experiential learning cycle. The pretest mean scores ranged from 2.77 to 3.00, suggesting limited proficiency in executing disaster drill activities. Specifically, the lowest mean was observed in Concrete Experience ( $M = 2.77$ ,  $SD = 0.309$ ), indicating that students initially had difficulty performing disaster-related physical tasks. Similarly, Reflective Observation ( $M = 2.91$ ,  $SD = 0.142$ ) and Abstract Conceptualization ( $M = 2.97$ ,  $SD = 0.562$ ) reflected constrained

understanding and reflection on disaster preparedness concepts. Active Experimentation also recorded a moderate mean score ( $M = 3.00$ ,  $SD = 0.000$ ), suggesting limited application of learned strategies during drill execution.

After the implementation of the P.E.-Integrated Disaster Preparedness and Response Program, a marked increase in performance levels was observed across all indicators. Posttest mean scores ranged from 4.33 to 4.45, reflecting high levels of performance in executing disaster drills. Concrete Experience showed a notable improvement ( $M = 4.34$ ,  $SD = 0.281$ ), indicating enhanced physical engagement and task execution during drills. Reflective Observation also increased substantially ( $M = 4.33$ ,  $SD = 0.358$ ), suggesting improved student reflection and awareness during disaster preparedness activities. Likewise, Abstract Conceptualization registered a high posttest mean ( $M = 4.42$ ,  $SD = 0.319$ ), reflecting strengthened understanding of disaster-related concepts. The highest posttest mean was observed in Active Experimentation ( $M = 4.45$ ,  $SD = 0.401$ ), indicating that students were able to effectively apply learned skills and strategies in actual drill situations.

The findings align with Kolb's Experiential Learning Theory (ELT), which emphasizes that effective learning occurs when students cycle through all four stages: Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. The marked improvement in posttest scores across all stages suggests that the P.E.-Integrated Disaster Preparedness and Response Program provided students with valuable hands-on experiences, enhanced reflection, and deeper conceptual understanding of disaster preparedness. As a result, students were able to apply their learning more effectively in real-world disaster drills, demonstrating the success of experiential learning in enhancing disaster response skills (Andreassen, Elvegård, & Eid, 2023).

The findings are supported by Abbas et al. (2023), who highlighted the effectiveness of simulation-based learning in disaster preparedness, particularly through the use of immersive technologies like virtual reality (VR). Similar to the P.E.-Integrated Disaster Preparedness and Response Program, VR simulations provide learners with opportunities to engage in realistic, risk-free disaster scenarios, enhancing both decision-making and technical skills. This approach, as noted by Abbas et al. (2023), improves learner engagement and preparedness, which aligns with the significant improvement in student performance observed in the current study, demonstrating the value of experiential learning in disaster response training.

The specific key results of this study demonstrate a significant improvement in students' performance in disaster drills after the implementation of the P.E.-Integrated Disaster Preparedness and Response Program. The notable increase in scores across all four stages of Kolb's experiential learning cycle (Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation) reflects enhanced disaster readiness. This aligns with Moslehi et al. (2022), who found that simulation-based training in emergency settings significantly improved teamwork and coordination, crucial elements in disaster response. The improvement in performance, particularly in Active Experimentation, highlights the practical application of learned skills, filling the gap in disaster response training by integrating real-world experiences that enhance not just individual performance but also the collective coordination necessary in disaster scenarios (Moslehi et al., 2022).

The difference between students' pre-test and post-test performance in disaster response activities.

The paired-samples t-test results comparing students' pretest and posttest performance in disaster response physical activity. Results show statistically significant differences across all experiential learning dimensions, Concrete Experience, Reflective Observation, Abstract

Conceptualization, and Active Experimentation (all  $p < .001$ ). Posttest mean scores were substantially higher than pretest scores in all indicators, indicating marked improvement after the implementation of the P.E.-Integrated Disaster Preparedness and Response Program. The large effect sizes ( $d = -3.46$  to  $-4.55$ ) further confirm the strong practical impact of the intervention on students' disaster response performance.

The significant improvement in students' performance, as indicated by the paired-samples t-test results, is consistent with Kolb's Experiential Learning Theory (ELT). According to ELT, learning is a dynamic process that thrives on the cycle of experiencing, reflecting, conceptualizing, and experimenting. The marked increase in posttest scores across all stages (Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation) suggests that the P.E.-Integrated Program effectively engaged students in hands-on learning experiences that fostered reflection, deeper understanding, and application of disaster preparedness skills. The large effect sizes (ranging from 3.46 to 4.55) further support the theory, indicating that the program had a robust and significant impact on students' disaster response abilities, demonstrating the power of experiential learning to facilitate skill acquisition and retention in high-stakes environments (Andreassen, Elvegård, & Eid, 2023).

The findings of this study are supported by Guo et al. (2025), who highlighted the benefits of integrating disaster preparedness into physical education programs. Their scoping review found that this approach not only enhances students' physical abilities but also builds mental resilience, preparing them for emergencies. Similarly, the marked improvement in disaster response performance observed in this study suggests that incorporating disaster preparedness into physical education programs is an effective strategy for improving both physical and cognitive skills required for handling crises (Guo et al., 2025).

The results of this study reveal a significant improvement in students' disaster response performance after the implementation of the P.E.-Integrated Disaster Preparedness and Response Program, filling a critical gap in disaster preparedness education. The substantial increase in posttest scores across all stages of Kolb's experiential learning cycle indicates that students not only gained physical skills but also enhanced their cognitive understanding and application of disaster response techniques. This aligns with Muhyi et al. (2025), who found that integrating disaster preparedness into physical education, such as earthquake drills and physical fitness activities, improves both physical readiness and emergency response. By combining physical training with disaster response, the P.E.-Integrated Program effectively addressed the gap in traditional disaster preparedness education by equipping students with the knowledge, skills, and confidence to respond effectively during emergencies (Muhyi et al., 2025).

The challenges faced during the program's implementation.

The table reveals several emerging themes and challenges encountered by students during the P.E.-Integrated Disaster Preparedness and Response Program. Under the theme of "Difficulties and Confusions in Drills and Activities," participants shared varied experiences, with some finding the drills easy to understand, while others struggled, particularly with complex tasks like the maze exercise. Regarding "Challenges with Instructions and Steps," most participants found the instructions clear, but a few mentioned difficulties following specific stages, such as coordinating with a partner. The "Physical Limitations and Challenges" theme highlighted concerns about physical barriers, with some students mentioning issues like asthma or dizziness, but they also discussed strategies for overcoming these challenges, such as adjusting pace or focusing on their movements. "Issues with Time, Space, or Materials" brought attention to logistical difficulties, such as insufficient space or the need for more

realistic materials, though most participants reported no major issues. Lastly, under "Impact of Communication and Teamwork on Performance," participants acknowledged that effective communication and collaboration were key to successfully completing the drills, with team coordination strategies like clear discussions and mutual support helping participants navigate challenges more smoothly.

The findings align with Kolb's Experiential Learning Theory (ELT), which posits that learning is enhanced through direct engagement, reflection, conceptualization, and experimentation. The challenges faced during the drills, such as physical limitations and instructional difficulties, demonstrate the importance of Concrete Experience and Reflective Observation, where students engage in real tasks and reflect on their experiences. Moreover, the emphasis on teamwork and communication reflects the role of Abstract Conceptualization, as students collaborate and refine strategies based on collective feedback, enhancing their ability to respond effectively to disasters (Andreassen, Elvegård, & Eid, 2023).

The findings of this study are supported by Dispo (2025), who explored how structured physical training in the PATHFit program improved students' physical performance and emergency preparedness. Similar to the P.E.-Integrated Disaster Preparedness and Response Program, the PATHFit program combined physical fitness with disaster readiness, resulting in significant gains in coordination, agility, and balance, skills that are essential for effective disaster response. Dispo (2025) emphasized that integrating fitness and preparedness helps students build both physical and mental resilience, which aligns with the improvements observed in this study where students showed better disaster response abilities through active engagement and teamwork. This highlights the importance of combining physical training with practical disaster preparedness to create more resilient individuals capable of handling crises.

The results of this study reveal significant improvements in students' disaster response skills following the P.E.-Integrated Disaster Preparedness and Response Program, addressing gaps in traditional disaster preparedness training. The increased performance across the experiential learning stages highlights the value of integrating physical fitness with emergency response drills, much like Soh et al. (2023) found with core training in soccer players, where agility and stability were enhanced, improving overall performance. This aligns with Abate et al. (2021), whose study demonstrated how structured physical conditioning exercises improved key skill-related fitness components like agility and balance, directly benefiting both physical fitness and overall well-being. The integration of physical training in disaster preparedness fills the gap by not only enhancing physical readiness but also fostering mental and emotional resilience, creating more capable individuals who can perform well under pressure in real-life crisis situations (Soh et al., 2023; Abate et al., 2021).

The effectiveness of the P.E.-Integrated Program in enhancing students' disaster readiness.

Effectiveness of the P.E.-Integrated Disaster Preparedness and Response Program in Enhancing Disaster Readiness of Tertiary Students in Terms of Concrete Experience

The effectiveness of the P.E.-Integrated Disaster Preparedness and Response Program in enhancing the disaster readiness of tertiary students in terms of Concrete Experience. The findings indicate that the program was very effective, as reflected by the high weighted mean scores across all indicators. Among the indicators, the statement "The drills helped me perform evacuation and safety movements more effectively" obtained the highest weighted mean ( $WM = 4.65$ ,  $SD = 0.580$ ), ranked first and verbally interpreted as Very Effective. This suggests that the program significantly improved students' ability to execute evacuation procedures and safety-related physical movements during disaster scenarios.

The indicator “The program provided realistic and practical experiences applicable to actual emergencies” ranked second with a weighted mean of 4.58 (SD = 0.636), also interpreted as Very Effective. This result implies that the activities included in the program closely resembled real-life emergency situations, allowing students to gain practical and meaningful disaster-response experiences. Similarly, the indicator “I was able to participate actively and practice the required disaster-response skills” obtained a weighted mean of 4.53 (SD = 0.599), ranking third with a verbal interpretation of Very Effective. This finding highlights the active involvement of students in hands-on disaster-response activities, which contributed to the development of their physical readiness and skill proficiency. The indicator “The P.E.-integrated activities increased my confidence in responding physically during disasters” recorded a weighted mean of 4.45 (SD = 0.677), ranking fourth and still interpreted as Very Effective. This indicates that participation in the program enhanced students’ confidence in their ability to respond appropriately and physically during disaster situations.

The findings align with Kolb’s Experiential Learning Theory (ELT), which emphasizes the importance of concrete experiences in the learning process. The high effectiveness ratings, particularly for indicators like evacuation performance and confidence-building, suggest that the P.E.-Integrated Program successfully facilitated the Concrete Experience stage by providing students with hands-on, realistic disaster response training. By actively participating in drills that mimicked real-life emergency situations, students were able to engage deeply in experiential learning, reinforcing their skills and confidence. This approach supports Kolb’s theory, which asserts that direct experience is crucial for developing practical skills and preparing individuals for real-world applications (Andreassen et al., 2023).

The results of this study connect well with the findings of Damaševičius et al. (2023) and Zhu and Li (2021), who looked at how new technologies can improve disaster training. Damaševičius et al. (2023) found that using real-time data and better communication tools helps emergency responders work together more smoothly and make faster decisions. In a similar way, Zhu and Li (2021) showed that VR and AR technologies allow responders to practice in realistic, risk-free environments, giving them hands-on experience without the dangers of real disasters. These studies back up the results of the P.E.-Integrated Program, which focused on hands-on training to boost students’ ability and confidence in responding to emergencies.

The results of this study show that hands-on disaster preparedness training, like the P.E.-Integrated Disaster Preparedness and Response Program, can significantly improve students’ physical readiness and confidence in responding to disasters. Hill and Weinstock (2022) found that disaster response training not only improved the skills but also the psychological resilience of healthcare professionals in high-pressure situations, a finding that mirrors the increased confidence observed in students after their involvement in this program. Additionally, Bernard et al. (2021) highlighted the role of physical fitness in boosting resilience to climate-related disasters, suggesting that regular physical activity is key to improving overall disaster response. These studies reinforce the idea that integrating physical activity with disaster preparedness training helps bridge the gap by enhancing both physical and mental readiness for real-world emergencies.

#### Effectiveness of the P.E.-Integrated Disaster Preparedness and Response Program in Enhancing Disaster Readiness of Tertiary Students in Terms of Reflective Observation

The effectiveness of the P.E.-Integrated Disaster Preparedness and Response Program in enhancing the disaster readiness of tertiary students in terms of Reflective Observation. The results indicate that the program was very effective, as shown by the consistently high mean scores across all indicators. Among the indicators, the statement “The debriefing or discussions

helped me reflect on my actions and reactions during the drills” obtained the highest mean score ( $M = 4.55$ ,  $SD = 0.597$ ), ranking first and verbally interpreted as Very Effective. This suggests that post-activity discussions and debriefing sessions played a significant role in helping students critically reflect on their performance during disaster response activities.

The indicator “I was able to observe how my classmates handled the drills and learned from their performance” ranked second with a mean of 4.53 ( $SD = 0.716$ ), also interpreted as Very Effective. This finding indicates that peer observation contributed to students’ learning by allowing them to compare strategies, techniques, and responses during disaster drills. The statement “The program helped me identify which parts of the drills I performed well or poorly” obtained a mean score of 4.50 ( $SD = 0.679$ ), ranking third with a verbal interpretation of Very Effective. This implies that the program enhanced students’ self-evaluation skills, enabling them to recognize their strengths and areas for improvement during disaster response activities. Lastly, the indicator “I became more aware of my physical limits and areas needing improvement” recorded a mean of 4.42 ( $SD = 0.712$ ), ranking fourth and still interpreted as Very Effective. This result reflects increased self-awareness among students regarding their physical capabilities and limitations in performing disaster-response tasks.

These findings align with Kolb’s Experiential Learning Theory (ELT), which emphasizes the importance of reflection in the learning cycle. According to Kolb, Reflective Observation is a key stage where learners evaluate their experiences, identify areas for improvement, and form new understandings. The high effectiveness ratings for the indicators related to reflection, self-evaluation, and peer learning show that the program successfully allowed students to reflect on their disaster response actions, improving their skills for future situations. This reflective process not only enhanced their awareness of their physical and mental limitations but also helped them refine their strategies, making them more prepared for real-life disaster scenarios (Andreassen et al., 2023).

The findings of this study are supported by Abe’s (2025) work, which emphasizes the importance of combining innovative methods with traditional disaster response strategies to improve overall preparedness. Abe’s research highlights how incorporating environmental monitoring, such as bird guano sampling, can enhance early detection of biological hazards, much like the P.E.-Integrated Program’s use of debriefings and peer observations to improve disaster response. By encouraging students to reflect on their performance and learn from each other, the program mirrors the approach of integrating new techniques into training to strengthen response capabilities. This approach not only enhances the students’ practical skills but also prepares them for complex and evolving challenges in disaster scenarios.

The findings of this study show that the P.E.-Integrated Disaster Preparedness and Response Program was highly effective in enhancing students’ ability to reflect on their performance and identify areas for improvement. The post-drill debriefing sessions and peer observations were particularly effective in helping students evaluate their actions, a key component of Reflective Observation in Kolb’s Experiential Learning Theory. This approach is aligned with Cotoron’s (2025) work, which stresses the importance of building local capacity to handle critical information and improve community responses during crises. Just as Cotoron highlighted the need for media literacy and communication skills to combat misinformation, the P.E.-Integrated program empowers students by teaching them to critically assess their own disaster response, ensuring that they can act swiftly and effectively in real-world emergencies. By focusing on both personal reflection and peer learning, this program addresses the gap in disaster preparedness by not only improving practical skills but also enhancing decision-making and self-awareness.

## Effectiveness of the P.E.-Integrated Disaster Preparedness and Response Program in Enhancing Disaster Readiness of Tertiary Students in Terms of Abstract Conceptualization

The effectiveness of the P.E.-Integrated Disaster Preparedness and Response Program in enhancing the disaster readiness of tertiary students in terms of Abstract Conceptualization. The findings indicate that the program was very effective, as reflected by the high mean scores across all indicators. The indicator “I learned why each physical movement or procedure is necessary during emergencies” obtained the highest mean score ( $M = 4.65$ ,  $SD = 0.533$ ), ranking first and verbally interpreted as Very Effective. This result suggests that the program successfully helped students understand the rationale behind disaster-response movements and procedures, strengthening their conceptual understanding of emergency actions.

The statement “I gained a better understanding of the proper steps during disaster scenarios” ranked second with a mean of 4.58 ( $SD = 0.594$ ), also interpreted as Very Effective. This indicates that students developed clearer mental frameworks regarding appropriate disaster-response procedures. The indicator “The program helped me connect the drills to real-life disaster management concepts” obtained a mean score of 4.53 ( $SD = 0.599$ ), ranking third with a verbal interpretation of Very Effective. This finding implies that the program enabled students to link practical drill activities with broader disaster management principles, enhancing knowledge transfer from practice to real-world application. Lastly, the indicator “I can explain the logic behind evacuation routes, protective postures, and safety behaviors” recorded a mean of 4.22 ( $SD = 0.768$ ), ranking fourth but still verbally interpreted as Very Effective. This suggests that students were able to articulate the reasoning behind key disaster preparedness strategies, demonstrating improved conceptual clarity.

These results align with Kolb’s Experiential Learning Theory (ELT), particularly the Abstract Conceptualization stage, where learners develop theories or concepts based on their experiences. The high effectiveness scores in understanding the rationale behind physical movements and procedures indicate that the program successfully helped students move beyond just performing tasks to understanding the underlying principles of disaster response. This stage of learning is crucial because it allows students to form mental models that connect their direct experiences (Concrete Experience) with broader concepts (Abstract Conceptualization), enhancing their ability to apply learned skills in real-world disaster situations. By focusing on both practical drills and conceptual understanding, the program filled the gap between hands-on practice and theoretical knowledge, ensuring that students are not only capable of responding physically but also able to explain and adapt their actions in a disaster context (Andreassen et al., 2023).

The findings of this study are supported by Damaševičius et al. (2023), who emphasized the importance of integrating technology into disaster response training. Just as the P.E.-Integrated Disaster Preparedness and Response Program helped students connect practical drills to real-world disaster management concepts, Damaševičius et al. (2023) found that using real-time data and IoES in training improved decision-making and coordination during emergencies. This technological approach allowed for more efficient communication and quicker responses, which is similar to how the program enhanced students' ability to act effectively in disaster situations. Both studies highlight the need for combining practical skills with conceptual understanding to ensure a well-rounded, efficient response to crises.

The study demonstrate that the P.E.-Integrated Disaster Preparedness and Response Program effectively enhanced students' conceptual understanding of disaster response, with high scores in indicators such as understanding the rationale behind disaster movements and recognizing the proper steps during disaster scenarios. Hill and Weinstock (2022) found that systematic disaster training for medical professionals improved both practical skills and psychological resilience, similar to how this program helped students connect drills to real-life

concepts and build confidence. The students not only learned physical skills but also gained a better understanding of why specific actions are essential, which strengthens both their mental preparedness and ability to make quick decisions under pressure. By offering a combination of hands-on drills and conceptual understanding, the program fills the gap in traditional disaster preparedness, ensuring that students are both practically and mentally equipped for emergencies, just as healthcare workers are through continuous training (Hill & Weinstock, 2022).

#### Effectiveness of the P.E.-Integrated Disaster Preparedness and Response Program in Enhancing Disaster Readiness of Tertiary Students in Terms of Active Experimentation

The effectiveness of the P.E.-Integrated Disaster Preparedness and Response Program in enhancing the disaster readiness of tertiary students in terms of Active Experimentation. The results show that the program was very effective, as evidenced by the high mean scores across all indicators. Among the indicators, the statement “The program improved my ability to make quick decisions during simulated emergencies” obtained the highest mean score ( $M = 4.58$ ,  $SD = 0.594$ ), ranking first and verbally interpreted as Very Effective. This indicates that the program effectively enhanced students’ decision-making skills in dynamic and time-sensitive disaster situations.

The indicator “I can now adjust my movements more effectively in response to changing conditions during drills” ranked second with a mean of 4.45 ( $SD = 0.597$ ), also interpreted as Very Effective. This finding suggests that students developed greater adaptability and responsiveness when performing disaster-response physical activities. The statement “I became more coordinated when working with classmates during group drills” obtained a mean score of 4.35 ( $SD = 0.770$ ), ranking third with a verbal interpretation of Very Effective. This result reflects improved teamwork and coordination among students during collaborative disaster response exercises. Lastly, the indicator “I feel more prepared to apply what I learned in real disaster situations” recorded a mean of 4.33 ( $SD = 0.764$ ), ranking fourth but still verbally interpreted as Very Effective. This indicates that students perceived themselves as more capable of transferring learned skills to actual disaster contexts.

Align with Kolb’s Experiential Learning Theory (ELT), particularly the Active Experimentation stage, where learners apply their knowledge and skills in real-world situations to test their understanding, the high effectiveness ratings for decision-making, adaptability, and teamwork indicate that the program successfully allowed students to engage in real-time decision-making and problem-solving during drills, enhancing their ability to respond in dynamic and time-sensitive situations. The ability to adjust movements and work more effectively in groups also suggests that the program fostered a deeper understanding of the importance of flexibility and collaboration in disaster response. Overall, this stage of learning allowed students to bridge the gap between theoretical knowledge and practical application, helping them feel more prepared for real-world disaster scenarios (Andreassen et al., 2023).

The findings of this study are supported by Nopembri and Maryana (2021), who explored the benefits of game-based activities in enhancing physical preparedness for emergencies. Their research found that structured physical games, simulating disaster scenarios, helped students develop both physical skills and a deeper understanding of emergency procedures. This aligns with the results of the P.E.-Integrated Disaster Preparedness and Response Program, where students improved their adaptability, decision-making, and coordination during drills. Nopembri and Maryana (2021) concluded that game-based learning in disaster preparedness engages students while teaching vital skills, which is reflected in the success of this program in preparing students for real-world emergencies.

The results of this study show that the P.E.-Integrated Disaster Preparedness and Response Program effectively enhanced students' ability to apply learned skills in disaster situations, filling a gap in traditional preparedness programs. The high scores for indicators like decision-making and adaptability suggest that students not only learned physical movements but also gained a deeper understanding of how to act quickly and effectively during emergencies. This approach mirrors Pan's (2025) findings, which emphasize the importance of prior disaster experience and attitudes toward disaster preparedness in shaping students' engagement in training. Pan's study highlights that hands-on training in realistic scenarios improves preparedness, which is exactly what the P.E.-Integrated program achieved by using dynamic, real-world simulations that better prepare students for real-life emergencies.

#### Summary Statistics on the Effectiveness of the P.E.-Integrated Disaster Preparedness and Response Program in Enhancing Disaster Readiness of Tertiary Students

The summary statistics on the effectiveness of the P.E.-Integrated Disaster Preparedness and Response Program in enhancing the disaster readiness of tertiary students in terms of Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. The results show that the program was rated Very Effective across all variables, as indicated by the consistently high average weighted mean scores. Among the four variables, Concrete Experience obtained the highest average weighted mean (AWM = 4.55), ranking first. This indicates that the program was most effective in improving students' hands-on participation, physical execution of disaster-response movements, and confidence during disaster drills.

Reflective Observation ranked second with an average weighted mean of 4.50, also verbally interpreted as Very Effective. This suggests that the program successfully enhanced students' ability to reflect on their performance, observe peers, and learn from debriefing sessions following disaster-response activities. Abstract Conceptualization placed third with an average weighted mean of 4.49, indicating that students developed a strong understanding of disaster preparedness concepts and the rationale behind emergency procedures. This reflects the program's effectiveness in strengthening students' conceptual knowledge related to disaster response. Lastly, Active Experimentation obtained an average weighted mean of 4.43, ranking fourth but still interpreted as Very Effective. This indicates that students were able to apply learned concepts, adapt their actions, make quick decisions, and collaborate effectively during disaster-response activities.

The results indicate that the P.E.-Integrated Disaster Preparedness and Response Program was highly effective across all four stages of Kolb's Experiential Learning Theory (ELT). Concrete Experience ( $M = 4.55$ ) ranked highest, showing that students gained hands-on experience and confidence during drills, which aligns with Kolb's focus on the importance of direct involvement in the learning process. The high ratings in Reflective Observation, Abstract Conceptualization, and Active Experimentation ( $M = 4.50$ ,  $M = 4.49$ , and  $M = 4.43$ , respectively) further demonstrate that students were able to reflect on their actions, understand disaster response concepts, and apply these lessons in practical scenarios, reinforcing Kolb's view of how experience, reflection, and experimentation are critical to deep learning (Andreassen et al., 2023).

The findings of this study reveal that the P.E.-Integrated Disaster Preparedness and Response Program was effective in enhancing students' disaster readiness across all four stages of experiential learning. The high ratings in Concrete Experience ( $M = 4.55$ ) suggest that students actively participated in drills and gained confidence, which addresses the gap in hands-on, physical disaster-response training. The program also excelled in Reflective Observation ( $M = 4.50$ ), enabling students to reflect on their actions and learn from peers, further

strengthening their response skills. Abstract Conceptualization ( $M = 4.49$ ) indicates that students not only improved their physical readiness but also gained a deeper understanding of the rationale behind emergency procedures, filling the gap in conceptual knowledge. Finally, Active Experimentation ( $M = 4.43$ ) showed that students were able to apply learned concepts, adapt to changing conditions, and collaborate effectively, which supports Said and Chiang's (2020) recommendation to integrate both technical skills and psychological preparedness in disaster training programs. This holistic approach is essential for ensuring well-rounded disaster preparedness, addressing both the physical and mental challenges faced during emergencies.

#### Evaluating the Effectiveness of the P.E.-Integrated Disaster Preparedness and Response Program in Enhancing Tertiary Students' Readiness

The findings highlight the significant impact of the P.E.-Integrated Disaster Preparedness and Response Program on students' disaster preparedness and confidence. Many participants felt more prepared for real-world disaster situations, with drills helping them learn how to respond quickly and effectively. Statements like "It helps me to become more aware and more informed about what should be done" (Participant 10) reflect the program's success in increasing students' awareness of disaster response procedures. Participants also mentioned that specific drills, such as the obstacle course and evacuation exercises, boosted their confidence, with one participant stating, "Crossing the obstacles had the biggest impact because everyone moved fast and worked well together" (Participant 6).

Additionally, students reported that the program effectively connected physical activities to mental readiness. Many participants emphasized how practicing quick decision-making and crisis management during drills helped improve their cognitive skills, as one participant noted, "It improves my awareness by practicing my observation and quick thinking" (Participant 10). The program's relevance to real-world disaster scenarios was also evident, with students appreciating how realistic the activities felt. Some participants, like Participant 15, who is a nursing student, mentioned that the program was highly useful for their field, stating, "It was really useful for me as a college student because this drill isn't just like the traditional drill that every school did." Despite a few suggestions for improvement, such as adding more obstacles or increasing the space for drills, overall feedback indicated strong satisfaction with the program's effectiveness and relevance.

The results of this study indicate that the P.E.-Integrated Disaster Preparedness and Response Program successfully filled the gap in traditional disaster training by integrating both physical and cognitive preparation in realistic scenarios. The high ratings in areas such as increased disaster preparedness and confidence demonstrate the program's ability to provide hands-on, practical experiences that helped students feel more capable of handling real disaster situations. This approach aligns with Zhu and Li's (2021) findings on the effectiveness of immersive technologies like VR and AR, which offer controlled environments to practice complex disaster scenarios. Just as VR/AR enhances realism and hands-on experience in training, the physical drills and activities in this program allowed students to directly engage with the skills they need to respond to emergencies, improving both their physical abilities and decision-making. The emphasis on practical application through drills and critical reflection during debriefings further strengthens students' preparedness, much like the immersive training environments described by Zhu and Li, filling the gap in both physical and cognitive aspects of disaster readiness.

## CONCLUSION

The findings of this study provide substantial evidence that the Physical Education-Integrated Disaster Preparedness and Response Program is a highly effective intervention for enhancing the disaster readiness of tertiary students at Jose Rizal University. Prior to the implementation of the program, students demonstrated only moderate performance levels across all four components of Kolb's Experiential Learning Theory, with pretest mean scores ranging from 2.77 to 3.00. These baseline results revealed limited proficiency in executing disaster-response physical tasks, constrained conceptual understanding of emergency procedures, and restricted capacity for applying learned strategies during drill execution. Following the completion of the program, a marked and statistically significant improvement was observed across all indicators, with posttest mean scores ranging from 4.33 to 4.45. The highest posttest performance was recorded in Active Experimentation ( $M = 4.45$ ), while Concrete Experience ( $M = 4.34$ ), Abstract Conceptualization ( $M = 4.42$ ), and Reflective Observation ( $M = 4.33$ ) each demonstrated comparable gains, collectively affirming the program's effectiveness in advancing students' physical and cognitive disaster preparedness.

Statistical analysis further validated the significance of these improvements. Paired-samples t-tests conducted across all four experiential learning dimensions yielded p-values below .001, confirming that the observed differences between pretest and posttest scores were not attributable to chance. The large effect sizes, ranging from  $d = -3.46$  to  $d = -4.55$ , further underscore the substantial practical impact of the intervention on students' disaster response capabilities. These results demonstrate that the integration of structured physical simulation activities within the PATHFIT curriculum produced robust and measurable gains in students' ability to perform evacuation procedures, coordinate with peers, make rapid decisions under pressure, and adapt their responses to dynamic emergency conditions. Such outcomes affirm the theoretical foundation of the study, as learning progressed through all four stages of Kolb's Experiential Learning cycle, from direct physical engagement to reflective analysis, conceptual understanding, and ultimately the application of acquired skills in simulated real-world contexts.

The challenges encountered during program implementation further illuminated the complexities inherent in translating disaster preparedness theory into embodied physical practice. Students reported varying levels of difficulty with certain drill components, particularly complex exercises such as the maze activity and multi-step partner coordination tasks. Physical limitations, including concerns related to conditions such as asthma and dizziness, were also identified as barriers that influenced individual participation and performance. Logistical constraints, such as insufficient space and the perceived need for more realistic materials, were noted by some participants, although the majority reported no insurmountable obstacles. Despite these challenges, students demonstrated adaptive strategies, including adjustments in pacing, heightened focus on movement sequencing, and deliberate reliance on peer communication and teamwork. Effective inter-group coordination was consistently highlighted as a decisive factor in successfully completing collaborative drills, with participants noting that clear communication and mutual support significantly enhanced their collective performance. These qualitative insights reinforced the role of social interaction and reflective observation in the experiential learning process and underscored the necessity of designing future iterations of the program with greater sensitivity to individual physical variation and spatial requirements.

Regarding the perceived effectiveness of the program, survey data gathered through a 5-point Likert scale instrument yielded consistently high average weighted mean scores across all four dimensions of experiential learning, with the overall ratings ranging from 4.43 to 4.55, all interpreted as Very Effective. Concrete Experience obtained the highest average weighted

mean of 4.55, reflecting the program's particular strength in improving students' hands-on participation, physical execution of disaster-response movements, and personal confidence during drills. Notably, the indicator "The drills helped me perform evacuation and safety movements more effectively" registered the highest individual weighted mean score of 4.65, suggesting that the program's evacuation-focused activities were especially impactful in developing students' practical readiness. Reflective Observation ranked second with an average weighted mean of 4.50, indicating that post-drill debriefing sessions and peer observation opportunities meaningfully enhanced students' capacity for self-evaluation and critical reflection on their performance. Abstract Conceptualization placed third with an average weighted mean of 4.49, with the indicator "I learned why each physical movement or procedure is necessary during emergencies" receiving the highest individual mean score of 4.65, demonstrating that students developed a strong conceptual understanding of the rationale underpinning emergency procedures. Active Experimentation registered an average weighted mean of 4.43, with "The program improved my ability to make quick decisions during simulated emergencies" receiving the highest individual score of 4.58, affirming that students experienced meaningful gains in decision-making agility, adaptability, and collaborative response capacity.

Qualitative feedback from focus group discussions complemented and enriched these quantitative findings, with participants expressing heightened awareness, increased confidence, and a stronger sense of readiness for real-world disaster scenarios. Students described the program's activities as more practical and realistic than conventional drills, with several noting that the integration of physical challenges into emergency response training transformed their understanding of preparedness from an abstract protocol into an embodied, actionable competency. The program's connection between physical activity and mental readiness was a recurring theme in participants' reflections, as students recognized that the cultivation of quick thinking, spatial awareness, and interpersonal coordination during drills directly translated into improved cognitive and behavioral readiness for actual emergencies. These perspectives affirmed the program's dual contribution to both physical fitness and cognitive preparedness, closing the gap between theoretical disaster education and practical, movement-based readiness.

In light of these findings, it is strongly recommended that the P.E.-Integrated Disaster Preparedness and Response Program be formally integrated into the broader PATHFIT curriculum as a sustained component of tertiary physical education. Academic institutions are encouraged to adopt this program as a structured model for combining fitness instruction with emergency readiness training, in alignment with the mandates of CHED Memorandum Order No. 39, Series of 2021, and the broader objectives of the National Disaster Risk Reduction and Management Council. Program administrators should consider addressing the implementation challenges identified in this study by allocating adequate facilities, providing adaptive accommodations for students with physical health concerns, and incorporating more varied and realistic materials to enhance the realism of drill environments. Additionally, future refinements to the program may benefit from expanding the range of disaster scenarios, incorporating stress management and psychological resilience components, and introducing formative reflection activities at more frequent intervals within each session. On a policy level, the empirical evidence generated by this study provides a credible basis for CHED and NDRRMC to explore the program as a scalable and replicable model for nationwide integration into tertiary physical education curricula. Ultimately, the P.E.-Integrated Disaster Preparedness and Response Program represents a meaningful and evidence-supported advancement in higher education's capacity to produce graduates who are not only physically capable but also cognitively and behaviorally prepared to respond effectively and confidently in times of crisis.

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