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DISASTER RISK REDUCTION AND MANAGEMENT AWARENESS AND ADAPTATION AS PREDICTORS OF TERTIARY STUDENTS' RESILIENCE

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ABSTRACT

This study examined how disaster risk reduction and management (DRRM) awareness and adaptation influence the resilience of tertiary students in Davao de Oro, Philippines. A quantitative, non-experimental design with descriptive, correlational, and predictive approaches was employed. Data were collected from a stratified sample using an adapted and pilot-tested questionnaire based on previously validated instruments. The tool measured students' awareness of earthquakes, floods, and typhoons, their behavioral and psychological adaptation, and levels of resilience. The results showed that students demonstrated high levels of awareness, adaptation, and resilience. Further analysis revealed that awareness and adaptation were significantly related to resilience, with psychological adaptation emerging as the strongest predictor. These findings support the theoretical insights of Bandura's Social Cognitive Theory and Bronfenbrenner's Ecological System Theory, suggesting that self-efficacy, emotional regulation, and a supportive environment play a meaningful role in shaping students' capacity to cope with adversity.

KEYWORDS: Disaster risk reduction, DRRM awareness, adaptation, resilience, Higher education, Philippines

1. INTRODUCTION

The Philippines, located along the Pacific Ring of Fire and the Western Pacific typhoon belt, is highly vulnerable to recurring natural hazards such as earthquakes, floods, and typhoons (PHIVOLCS, 2023); UNDRR, 2020). With climate change intensifying these events, their frequency and severity have become more difficult to predict (Robielos et al., 2022; IPCC, 2022). Flooding remains especially disruptive, stalling development and exposing infrastructure weakness. Kurata et al. (2023) point to poor drainage systems, recurring storms, and heavy rainfall as key contributors to the country's inadequate flood preparedness. Additionally, Ngcamu (2022) noted that climate-related events impacted a vast majority of about 97% of disaster-affected individuals. These developments highlight the growing urgency of strengthening disaster resilience, especially for at-risk groups.

Tertiary students are among those particularly affected during crises due to their dependence on institutional support, age-related vulnerabilities, and limited access to programs that build emotional preparedness. In disaster-prone areas like Davao de Oro, where earthquakes, typhoons, and floods are a regular threat, students face heightened risks to their well-being and academic stability (Dayagbil, 2023; Cueto & Agaton, 2021). While programs such as the National Service Training Program (NSTP) have improved disaster awareness and preparedness attitudes (Matunhay, 2022), a pressing need remains to assess how students adapt behaviorally and psychologically. Cabuga and Cañete (2023) further stress the effectiveness of school-based DRRM programs paired with early warning systems, reinforcing the importance of sustained institutional efforts.

Recent studies have shown that students who are more aware of disasters tend to be better prepared. For instance, Park (2019) found that nursing students who were more informed about disasters also exhibited stronger resilience. Similarly, Panase and Doruelo (2020) observed that students involved in regular drills developed more adaptive responses. Labaria et al. (2020) and Dayagbil (2023) found that schools offering mental health support helped students stay emotionally balanced during emergencies. Silva (2023) also showed that greater disaster-related knowledge improves readiness and strengthens students' confidence in managing emergencies. While these studies reveal the importance of awareness and emotional readiness, they treat these aspects in isolation. What remains unclear is how awareness and adaptation together contribute to resilience. This is the specific gap that the present study intends to address, particularly among Filipino college students.

This study draws on several theoretical frameworks to guide its analysis of disaster risk reduction and management (DRRM) awareness, adaptation, and resilience. Bronfenbrenner's Social-Ecological Systems Theory (1979) emphasizes the influence of broader social and institutional contexts on how students build resilience. Bandura's Social Cognitive Theory (1986) highlights the importance of self-efficacy and observational learning, both central to understanding how students psychologically adapt to disaster risks. Meanwhile, Rogers' Diffusion of Innovation Theory (2003) sheds light on how new preparedness behaviors are gradually adopted within student communities. Complementing these perspectives, the Disaster Resilience of Place (DROP) model by Cutter et al. (2008) integrates external risk exposure and internal recovery capacity, offering a place-based understanding of resilience.

Despite these theories' insights, few studies have explored how awareness and adaptation interact to shape student resilience, particularly within Philippine higher education. Villarino (2023) emphasized the importance of localized disaster education and early warning systems in rural settings, highlighting the need for studies that reflect specific regional contexts. This research investigates the extent of DRRM awareness, how students adjust behaviorally and psychologically, and how these elements contribute to their overall resilience. It aims to assess the levels of these variables among college students in hazard-prone areas of Davao de Oro, examine the relationships among them, and determine whether awareness and adaptation can serve as reliable predictors of how well students cope during and after disasters.

2. METHODS

Research Respondents. The respondents were college students across Davao de Oro from various higher education institutions. These included Davao de Oro State College (DDOSC), Monkayo College of Arts, Sciences, and Technology (MonCAST), Assumption College of Nabunturan (ACN), Legacy College of Compostela (LCC), and Kolehiyo ng Pantukan (KNP). Using Slovin's formula with a 5% margin of error and a total population of 21,577, the required sample size was determined to be 390. To ensure fair representation across all schools, stratified random sampling was employed. The number of respondents drawn from each institution reflected its proportion of the total population, allowing for balanced participation and a more accurate reflection of the student demographics in the province.

Research Instrument. The study employed an adapted survey questionnaire designed to align with the research objectives and reflect the local context of Davao de Oro. The items were drawn from previously validated instruments and revised to measure DRRM awareness, adaptation, and resilience among tertiary students. DRRM awareness was evaluated using a 15-item tool based on the work of Sauquillo et al. (2023), emphasizing preparedness for earthquakes, floods, and typhoons. Adaptation was measured through a 10-item scale adapted from Hafida et al. (2022), encompassing behavioral and psychological coping strategies. The resilience component incorporated the framework of Hutagalung and Prihantika (2021), which addresses coping's emotional, cognitive, and behavioral aspects. All items used a five-point Likert scale, with interpretation ranges set as follows: 4.20–5.00 (very high), 3.80–4.19 (high), 2.60–3.79 (moderate), 1.80–2.59 (low), and 1.00–1.79 (very low).

A pilot test was administered to 40 students not included in the main sample to ensure the tool's reliability and clarity. The results showed strong internal consistency across all subscales, with Cronbach's alpha coefficients of 0.913 for DRRM awareness, 0.876 for adaptation, and 0.967 for resilience. These values surpass the commonly accepted reliability threshold of 0.70, with scores above 0.90 indicating exceptional internal consistency (Izah, Sylva, & Hait, 2024).

Design and Procedure. This study followed a quantitative, non-experimental design using descriptive, correlational, and predictive methods. This approach was a good fit for exploring how DRRM awareness, adaptation, and resilience are connected since it looked at real conditions without changing anything. As Lapan and Quartaroli (2009) explain, this design works well in education because it studies variables as they naturally occur. The study used a structured survey adapted from previously validated tools to measure students' disaster awareness, how they adjust behaviorally and psychologically, and how resilient they are to hazards like earthquakes, floods, and typhoons. Before the survey was given, the researcher got approval from the UM Ethics Review Committee, the thesis panel, and the Dean of Graduate Studies at UM Tagum College. The heads of the participating schools also gave their permission to ensure the process was ethical and well-coordinated.

Surveys were personally distributed to students who met the inclusion criteria. Before answering the survey, each respondent was briefly informed about the purpose of the study, what the questionnaire covered, and their rights throughout the process. After the students finished the surveys, the researcher gathered them personally to keep the process orderly and secure. The responses were then reviewed, manually logged, and organized for statistical processing. Descriptive statistics were used to present the levels of each variable. At the same time, correlational and regression analyses helped determine the strength of the relationship and the predictive influence on DRRM awareness, adaptation, and resilience.

Throughout the process, the researcher observed strict ethical standards. All respondents provided informed consent, and their anonymity and confidentiality were safeguarded throughout the study. Following the Data Privacy Act of 2012, the data were retained for five years and then permanently deleted through secure wiping or physical destruction of the storage devices. These data-handling procedures followed ethical principles by collecting only what was necessary, managing the data carefully, and protecting sensitive information throughout the process (Smith & Brown, 2023).

The roles of contributors were made transparent from the start. The researcher ensured all contributions were fairly acknowledged, and the adviser's contributions will be recognized through co-authorship in future publications. The researcher upheld core values of fairness and ethical responsibility by being transparent about roles and recognition.

Appropriate statistical tools were utilized based on the research objectives to analyze the data gathered in this study. The mean was computed to describe the overall levels of DRRM awareness, adaptation, and resilience among tertiary students across various institutions in Davao de Oro. Pearson r measures the direction and intensity of the connection between awareness, adaptation, and resilience to examine how the variables were related. This test was appropriate since Likert-based composite scores were treated as continuous data, a common approach when assumptions of linearity and normality are reasonably met (Carifio & Perla, 2028). Finally, multiple regression was used to assess how well DRRM awareness and adaptation could predict levels of student resilience.

3. RESULTS

The result in Table 1 shows that respondents demonstrated a consistently very high level of awareness across all hazard types. Among the three, flood hazard awareness has the highest mean score ($M = 4.54$, $SD = 0.49$), suggesting that students are particularly well-informed about the risks and implications of flooding in the area. This may be attributed to the frequency of such events and the visible impact floods have on communities. Earthquake awareness followed closely with a mean of 4.42 ($SD = 0.46$), while typhoon hazard awareness received a slightly lower mean of 4.32 ($SD = 0.54$), though still within the "very high" category. These findings reflect those tertiary students are generally knowledgeable about natural hazards, possibly due to existing DRRM programs, prior disaster experience, and school-based disaster education initiatives.

Table 1. Level of DRRM Awareness

Indicators	Mean	SD	Description
Earthquake Hazard	4.42	0.46	Very High
Flood Hazard	4.54	0.49	Very High
Typhoon Hazard	4.32	0.54	Very High
Overall	4.42	0.42	Very High

Based on the table, college students in Davao de Oro showed a very high level of awareness when it comes to earthquakes, floods, and typhoons. Flood awareness ranked the highest, likely because floods happen more often in the area, and local schools and warning systems have been effective. The results suggest that students know about these hazards and understand how to stay safe. This intense awareness could be due to school-led programs, community experiences with disasters, and local information drives.

These results align with prior studies emphasizing the importance of contextualized hazard education. For example, Matunhay (2022) and Sauquillo et al. (2023) found that students exposed to structured awareness programs exhibit higher preparedness levels. The data further supports the relevance of targeted DRRM training in improving knowledge retention and readiness, especially in vulnerable regions. High awareness levels serve as a foundation for building adaptive behaviors and fostering resilience, confirming the theoretical position of Rogers' Diffusion of Innovation (2003), which shows the value of information dissemination in shifting preparedness norms.

Table 2 details the students' adaptation levels, which are categorized into behavioral and psychological dimensions. Behavioral adaptation received a very high mean score ($M = 4.37$, $SD = 0.54$), indicating that students actively engage in preparedness actions and response behaviors during disasters, such as a strong understanding of the basic emergency items necessary and frequent use of communication technologies like television, radio, and social media. While slightly lower, psychological adaptation still registered a high mean score ($M = 4.05$, $SD = 0.65$), suggesting that students generally possess strong internal coping skills, including the ability to remain calm, manage stress, and stay optimistic during disruptive events. The gap between behavioral and psychological adaptation may indicate a need for enhanced mental health support or resilience training to strengthen further students' capacity to deal with the emotional and cognitive challenges of disasters.

Table 2. Level of Adaptation

Indicators	Mean	SD	Description
Behavioral Adaptation	4.37	0.54	Very High
Psychological Adaptation	4.05	0.65	High
Overall	4.21	0.54	Very High

The appended table shows a very high behavioral and psychological adaptation level based on the student's responses. Students reported actively engaging in risk-reducing behaviors such as joining drills and staying informed through media, which indicates that preparedness efforts are internalized and practiced. However, the slightly lower psychological adaptation score could point to a need for improvement, especially in managing stress and uncertainty during disasters.

These results further support the findings of Hafida et al. (2022) and Dayagbil (2023), who stress that while behavioral responses are often visible and measurable, internal coping mechanisms require more focused support and development. The data reinforces Bandura's Social Cognitive Theory (1986), especially the role of self-efficacy in influencing how individuals respond to risk. The results indicate that institutional efforts should focus on physical preparedness and integrate mental health initiatives and emotional coping strategies to strengthen psychological adaptation.

As shown in Table 3 presents the levels of student resilience across seven indicators: emotional regulation, impulse control, optimism, ability to analyze, empathy, self-efficacy, and achievement. The highest mean score was observed in the achievement domain ($M = 4.53$, $SD = 0.55$), highlighting students' strong motivation and goal-directed behavior despite adversity. This was followed by impulse control and the ability to analyze ($M = 4.36$), showing that students can think critically and manage their reactions under pressure. Other indicators such as optimism ($M = 4.20$), empathy ($M = 4.28$), self-efficacy ($M = 4.24$), and emotional regulation ($M = 4.04$) also scored high or very high. Emotional regulation had the lowest mean, suggesting that while students are generally resilient, they may struggle to manage their emotions during crises consistently. These findings depict a student population with strong resilience traits shaped by personal strengths and possibly institutional support systems.

Table 3. Level of Resilience

Indicators	Mean	SD	Description
Emotional Regulation	4.04	0.67	High
Impulse Control	4.36	0.59	Very High
Optimism	4.20	0.63	Very High
Ability to Analyze	4.36	0.54	Very High
Empathy	4.28	0.57	Very High
Self-efficacy	4.24	0.63	Very High
Achievement	4.53	0.55	Very High
Overall	4.29	0.49	Very High

Based on the appended table, student resilience is rated very high, especially in achievement, impulse control, and problem-solving. This reflects their strong ability to recover and persevere through difficulties. However, emotional regulation, though still high, is the weakest area, suggesting room for growth in managing stress during crises.

These results reflect the findings of Hutagalung and Prihantika (2021), who highlighted achievement and impulse control as core traits of student resilience during disasters. This supports Bronfenbrenner's Ecological Systems Theory (1979), which emphasizes the role of both individual and environmental factors. The consistently high scores suggest that current DRRM efforts and community support systems effectively strengthen students' adaptive abilities.

As shown in Table 4, the correlation between DRRM awareness and student resilience was analyzed using Pearson r . All three hazard-specific awareness variables, earthquake, flood, and typhoon showed a statistically significant and positive relationship with resilience ($p = 0.001$). These results warranted the rejection of the null hypothesis. The typhoon hazard awareness had the strongest correlation ($r = 0.491$), followed closely by flood ($r = 0.487$) and earthquake ($r = 0.429$). This suggests that students more knowledgeable about disaster risks exhibit greater resilience, possibly due to a higher sense of preparedness and perceived control. The coefficient of determination (r^2) further supports this, showing that approximately 24.11% of the variance in student resilience can be explained by typhoon hazard awareness alone. These results highlight the importance of targeted awareness programs beyond basic information and encouraging meaningful understanding of specific hazards.

Table 4. Correlation Between DRRM Awareness and Resilience

Independent Variables	Dependent Variable	r-value	r ²	P-value	Decision
Earthquake Hazard	Student's Resilience	0.429*	0.1840	<0.001	Rejected H ₀
Flood Hazard		0.487*	0.2372	<0.001	Rejected H ₀
Typhoon Hazard		0.491*	0.2411	<0.001	Rejected H ₀

*p<0.05

The results show a significant positive relationship between DRRM awareness and student resilience, with moderate to strong links across earthquake, flood, and typhoon indicators. Typhoon awareness had the strongest connection, suggesting that understanding storm risks and safety steps helps students adjust and recover during crises. This highlights how being informed can boost confidence and preparedness. It also supports emotional stability, helping students make better decisions under pressure.

These findings support Bandura's Social Cognitive Theory (1986), which suggests that knowledge and self-belief are closely connected. They also validate empirical studies by Park (2019) and Silva (2023), emphasizing that hazard awareness significantly enhances preparedness behavior and ego-resilience. The positive relationship found in this study underscores the importance of sustained, localized DRRM education programs as a foundation for strengthening student resilience in disaster-prone regions.

Table 5 displays the relationship between the two forms of adaptation and student resilience. Both behavioral ($r = 0.585$) and psychological adaptation ($r = 0.657$) showed a strong, statistically significant positive correlation with resilience ($p = 0.001$). Therefore, the null hypothesis was rejected. These results suggest that students who actively prepare for disasters and demonstrate strong psychological coping skills are more likely to be resilient. Psychological adaptation had a higher correlation coefficient, indicating that internal cognitive and emotional strategies may be slightly more influential in building resilience than behavioral actions alone. The corresponding r^2 values reveal that psychological adaptation accounts for roughly 43.16% of the variation in resilience, further emphasizing its predictive power.

Table 5. Correlation Between Adaptation and Resilience

Independent Variables	Dependent Variable	r-value	r ²	P-value	Decision
Behavioral Adaptation	Student's Resilience	0.585*	0.3422	<0.001	Rejected H ₀
Psychological Adaptation	Resilience	0.657*	0.4316	<0.001	Rejected H ₀

*p<0.05

The relationship between the two levels of adaptation and the student's resiliency is statistically significant (more significant for psychological adaptation). These findings suggest that students who are prepared both in behavior and psychological readiness tend to demonstrate stronger resilience before, during, and after disaster events. The high correlation values indicate that adaptation is not only an action but also internal coping that matches endurance and recovery.

This finding aligns with the perspectives of Hafida et al. (2022) and Dayagbil (2023), who emphasized that psychological preparedness could determine resilience. It also complements Bronfenbrenner's Ecological Systems Theory (1979), which sees behavior and cognition as interacting with individual characteristics and environmental contexts. The results of this study highlight the need for schools to complement drills and logistical preparedness with mental health initiatives and reflective practices that foster emotional awareness and stress tolerance.

As shown in Table 6, the regression analysis examined the extent to which awareness of specific hazards predicts resilience among students. All three predictors (earthquake, flood, and typhoon awareness) were statistically significant ($p = 0.001$), leading to the rejection of the null hypothesis. Flood hazard awareness emerged as the strongest predictor ($\text{Beta} = 0.251$), followed by typhoon awareness ($\text{Beta} = 0.241$) and earthquake awareness ($\text{Beta} = 0.177$). These findings imply that students who are more informed about floods and typhoons are more likely to display resilient behaviors. The standardized beta values suggest that for every unit increase in flood awareness, there is a corresponding increase in resilience, controlling for the other variables. This may reflect the immediacy and recurrence of these regional hazards, prompting stronger preparedness behaviors and attitudes.

Table 6. Regression Analysis on the Influence of DRRM Awareness on Resilience

Independent Variable	Unstandardized Coefficient		Standardized Coefficient	t - value	p-value	Decision
	B	SE	β			
constant	1.397	0.225		6.207	<0.001	Rejected H_0
Earthquake	0.187	0.054	0.177*	3.461	<0.001	Rejected H_0
Flood	0.248	0.055	0.251*	4.551	<0.001	Rejected H_0
Typhoon	0.217	0.051	0.241*	4.240	<0.001	Rejected H_0
Dependent Variable: Student's Resilience						
R = 0.563		$R^2 = 0.317$		F-ratio = 59.684		P-value= 0.001

* $P < 0.05$

Regression analysis found that DRRM awareness is a significant predictor of resilience among tertiary students, with flood awareness exerting the most substantial predictive influence. The results indicate that knowledge of a specific hazard equips students to anticipate and be ready to act effectively, reducing their vulnerability and strengthening their confidence. The high value of R^2 (31.7%) indicates that DRRM awareness can explain a significant portion of the variance in resilience, further supporting its critical role in disaster education.

According to Rogers' Diffusion of Innovation Theory (2003), adopting new knowledge and practices, such as risk awareness, can lead to behavioral and psychological change. Flood awareness may be a strong predictor of such change, especially in communities that frequently experience flooding, as Ampo and Cabigan (2023) noted. This underscores the importance of enhancing students' awareness of local hazards and tailoring DRRM content to the geo-risk profile of their area to build resilience.

Table 7 presents the regression analysis results on the influence of adaptation on student resilience. Both behavioral (Beta = 0.289) and psychological adaptation (Beta = 0.478) were found to be significant predictors of resilience ($p = 0.001$), which the null hypothesis is rejected, with psychological adaptation showing a greater influence. The t-values and low standard errors for both predictors support the strength and reliability of the results. These outcomes indicate that behavioral efforts such as preparedness activities and communication technologies like television, radio, and social media are valuable. However, students' internal mental and emotional capacity to interpret, respond to, and recover from adversity is even more critical in developing resilience. The results underline the need for educational programs that teach physical preparedness and foster emotional intelligence, problem-solving, and mental health support for students facing disaster risks.

Table 7. Regression Analysis on the Influence of Adaptation to Resilience

Independent Variable	Unstandardized Coefficient		Standardized Coefficient	t - value	p-value	Decision
	B	SE	β			
constant	1.713	0.147		11.676	<0.001	Rejected H_0
Behavioral	0.258	0.042	0.289*	6.188	<0.001	Rejected H_0
Psychological	0.357	0.035	0.478*	10.246	<0.001	Rejected H_0
Dependent Variable: Student's Resilience						
R = 0.695		$R^2 = 0.483$		F-ratio = 180.474		P-value= 0.001

* $P < 0.05$

Adaptation significantly predicts student resilience, with psychological adaptation exerting a greater impact than behavioral strategies. This indicates that while preparedness behaviors matter, the students' internal coping capacities, such as emotional regulation, optimism, and self-efficacy, more powerfully forecast how well they can withstand and recover from disasters. The high R^2 value (48.3%) underscores adaptation's central role in resilience development.

These findings further support the value of integrating psychosocial components into DRRM programming. Bandura's theory (1986, 1997) again proves relevant, as students who believe in their ability to handle adversity are more likely to demonstrate resilient behaviors. Furthermore, this aligns with Cutter et al.'s (2008) DROP model, which suggests that exposure, resources, and personal capacity shape resilience. The results call for a shift in disaster preparedness approaches from purely external measures to interventions that build students' inner strength and emotional intelligence.

4. CONCLUSION AND RECOMMENDATIONS

The study's findings revealed that tertiary students in Davao de Oro exhibited very high levels of disaster awareness and resilience, especially with flood and typhoon hazards. Behavioral adaptation was also rated very high, reflecting students' consistent involvement in preparedness practices like emergency planning. Although psychological adaptation scored slightly lower than behavioral adaptation, it remained high overall, suggesting that students are generally capable of managing stress and emotional responses in disaster situations. These findings suggest that institutional education efforts and personal experiences have meaningfully contributed to students' readiness and coping capacity in disaster-prone settings.

Further analysis confirmed that disaster awareness and adaptation both significantly predict student resilience. Psychological adaptation had the most substantial impact, explaining the most significant portion of the variance in resilience scores. While awareness is important, emotional readiness, such as staying calm and focused, plays a key role in recovery. Flood and typhoon awareness also emerged as strong predictors, likely due to their frequent occurrence in the region, reinforcing students' preparedness and confidence.

These findings strongly support the theoretical foundations of the study. Bronfenbrenner's ecological framework is reflected in the role of institutional and community environments in shaping resilience. Rogers' diffusion theory shows how preparedness behaviors spread across student populations through organized programs and peer influence. Most notably, Bandura's social cognitive theory is affirmed through the predictive power of self-belief and adaptive thinking in managing disaster risk. Together, these results emphasize that building resilience in students requires not just information but integrated support systems that develop both external awareness and internal strength. This alignment with the guiding theories confirms the study's conceptual foundation and strengthens the rationale for offering recommendations rooted in established theoretical principles.

Based on the study's findings, several practical and achievable steps are proposed to strengthen the resilience of tertiary students. Higher education institutions should continue strengthening DRRM practices, including disaster drills, seminars, and awareness campaigns. These initiatives have contributed to students' high awareness and behavioral adaptation levels and should remain a priority in organized school-level preparedness efforts.

Following Republic Act No. 10121 and CHED Memorandum Order No. 01, series of 2019, schools are also encouraged to address the psychological dimension of disaster readiness. Although psychological adaptation scored slightly lower than behavioral adaptation, it remained high overall and emerged as the strongest predictor of student resilience. These findings underscore the value of integrating mental health initiatives such as resilience training, peer support programs, and stress management activities into disaster preparedness efforts. Strengthening students' emotional and psychological readiness is just as important as equipping them with practical disaster knowledge. Institutions can enhance preparedness by helping students develop external competencies and internal coping mechanisms to respond effectively under pressure.

Future studies should examine how students cultivate these coping strategies, particularly in disaster-prone areas, by exploring psychological traits like emotional regulation, optimism, and self-efficacy. Additionally, research should consider the role of institutional support systems, including school policies, faculty involvement, and access to student services, in shaping resilience. A clearer understanding of personal and environmental influences can inform more targeted and effective DRRM strategies in higher education.

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