

Cognitive Engagement, Learning Strategies, Adjustment to College and Academic Motivation: A Structural Equation Model on Academic Success Among College Students

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Abstract

This study examined the relationships among cognitive engagement, learning strategies, adjustment to college, academic motivation, and academic success to determine the best-fit structural equation model among Bachelor of Elementary Education students in Region XIII (Caraga), Philippines. Anchored in Self-Regulated Learning Theory and Academic Adjustment Theory, the study employed a quantitative, non-experimental descriptive-correlational design involving 470 second-, third-, and fourth-year students from three state universities, selected through proportional stratified random sampling. Data were collected using five adapted, validated, and reliability-tested questionnaires and analyzed through descriptive statistics, Pearson correlation, and structural equation modeling. Results revealed very high levels of cognitive engagement ($M = 4.27$), learning strategies ($M = 4.32$), college adjustment ($M = 4.34$), academic motivation ($M = 4.32$), and academic success ($M = 4.31$). All four predictors demonstrated significant positive correlations with academic success, with academic motivation exhibiting the strongest relationship ($r = .519$). The final structural model demonstrated excellent fit ($CMIN/DF = .845$, $CFI = 1.000$, $RMSEA = .000$) and explained 32.5% of the variance in academic success. Academic motivation ($\beta = .270$, $p = .020$) and learning strategies ($\beta = .262$, $p = .017$) emerged as significant direct predictors, whereas college adjustment and cognitive engagement showed nonsignificant direct effects. The findings emphasize the importance of strengthening academic motivation and effective learning strategies through learner-centered instruction and institutional support programs. The study supports Sustainable Development Goal 4 (Quality Education) by providing evidence to inform educational practices and student success initiatives. Its sustainability contribution lies in supporting evidence-based academic planning, student retention, and continuous improvement in higher education.

Keywords: Academic Motivation; Academic Success; Adjustment to College; Cognitive Engagement; Learning Strategies; Multivariate; Structural Equation Modeling

1. Introduction

Academic success in higher education is influenced by cognitive, behavioral, motivational, and institutional factors. Cognitive engagement, learning strategies, adjustment to college, and academic motivation contribute to students' academic performance and persistence. Understanding their combined relationships is essential for

developing effective educational interventions. This study employs structural equation modeling to examine these factors and determine the best-fit model of academic success among college students.

Academic success contributes to students' professional development and future opportunities (Maghalian Ghafari, Osouli Tabrizi, Nikkhesal, & Mirghafourvand, 2023). However, excessive academic workloads, ineffective learning approaches, and behavioral challenges may hinder achievement. Institutional participation strengthens academic integration (Aguilon & Guhao; Jr., 2024), although student attrition remains a concern (Cai & Meng, 2025). Academic achievement also depends on motivation, institutional support, and effective study habits (Cao, Sanga Mithra, & Aravind, 2024), alongside resilience and self-regulated learning (Lim, Kim, & Park, 2023).

Cognitive engagement promotes active learning and academic achievement (Khan & Gul, 2023), while cognitive abilities support confidence, planning, persistence, working memory, and reasoning (Shi & Qu, 2021). Strategic thinking and challenging activities strengthen cognitive engagement (Bond et al., 2021), particularly through inquiry-based and cooperative instruction (Hiver et al., 2024; OECD, 2023). Learning strategies involve deliberate approaches to acquiring and applying knowledge (Tan, Din Eak, Ooi, & Abdullah, 2021). Instructional practices influence their application (Dahri et al., 2024), while systematic study habits and self-regulated learning improve academic performance (Hogh & Müller-Hike, 2021; Faza & Lestari, 2025; Fong et al., 2021; Koçak et al., 2021; Urbina Gutiérrez, 2025; Zhao et al., 2025). College adjustment is associated with personal beliefs, socioeconomic circumstances, and academic achievement (Hassan, 2023; Li, Jia, & Wang, 2023). Successful adjustment supports retention and well-being (Credé & Niehorster, 2023; Peltier et al., 2021), while resilience, self-efficacy, and faculty support facilitate institutional adaptation (Fernández-Castillo et al., 2024; UNESCO, 2023). Academic motivation encourages persistence and participation (Weiler & Murad, 2022). Intrinsic motivation supports sustained achievement and mastery-oriented learning (Kamberi, 2025; Gurang & Guhao Jr., 2024; Arokiaraj et al., 2024). Constructive feedback, autonomy-supportive instruction, emotional intelligence, and time management further strengthen academic performance (Jara Malpica, 2025; Törmänen et al., 2025; Chisholm-Burns et al., 2021).

International literature emphasizes cognitive engagement, learning strategies, motivation, and institutional adaptation as important determinants of academic success. In the Philippines, inadequate college adjustment has been associated with unfavorable academic outcomes (Vergara & Balquedra, 2024). These findings highlight the need to examine how these factors collectively influence academic success among college of education students within the Philippine higher education context.

The study is anchored in Self-Regulated Learning Theory (Zimmerman, 1986), which explains how students regulate cognitive, motivational, and behavioral processes. Supporting evidence emphasizes the importance of working memory, reasoning, learning strategies, and motivation (Theobald's (2021) meta-analysis). Academic Adjustment Theory (Baker & Siryk, 1989) further explains students' adaptation to institutional demands. The conceptual framework identifies cognitive engagement, learning strategies, adjustment to college, and academic motivation as exogenous variables predicting academic success. The endogenous variable encompasses general academic skills, internal motivation, perceived instructor efficacy, concentration, external motivation, socializing, career decidedness, lack of anxiety, and personal adjustment. The model specifies direct relationships between the predictors and academic success, with correlations among the exogenous variables.

Existing studies have largely examined cognitive engagement, learning strategies, college adjustment, and academic motivation independently or through limited relationships. Few have integrated all four constructs into a comprehensive structural equation model explaining academic success (Echeverría et al., 2026). Addressing this gap, the study seeks to determine the best-fit structural model among college of education students and provide evidence for developing integrated academic support interventions in Philippine higher education. Specifically, the study examines the levels of cognitive engagement, learning strategies, college adjustment, academic motivation, and academic success; determines their significant relationships; and identifies the best-fit structural model. The null hypotheses concerning these relationships and model fit are tested at the 0.05 significance level.

The study primarily supports SDG 4 (Quality Education) by examining factors associated with improved learning outcomes and academic persistence. It also aligns with SDG 3 (Good Health and Well-Being) through emotional adjustment and academic well-being, SDG 8 (Decent Work and Economic Growth) through preparation for future employment, and SDG 10 (Reduced Inequalities) through its potential to inform inclusive academic support strategies.

The study contributes to educational sustainability by identifying cognitive, strategic, adaptive, and motivational factors associated with academic achievement. Its findings may support institutional sustainability through improved instructional practices, student support services, curriculum development, and evidence-based academic planning. Furthermore, strengthening academic success may contribute to socioeconomic sustainability by

promoting student retention, professional readiness, and workforce development. The proposed structural model may also provide a foundation for future research and continuous improvement in higher education.

2. Material and methods

2.1 Research Design

The study utilized a quantitative, non-experimental descriptive-correlational research design to examine the relationships among the identified variables without manipulating study conditions (Hassan, 2023). Structural Equation Modeling (SEM) was employed to identify the best-fit model of academic success by examining relationships among observed and latent variables (Jain & Chetty, 2021). This approach enabled the simultaneous evaluation of cognitive engagement, learning strategies, college adjustment, and academic motivation as predictors of academic success.

2.2 Locale of the Study

The study was conducted across three state universities in Region XIII (Caraga), Philippines, covering campuses in Bunawan, Butuan City, Surigao City, Tandag, Tagbina, and Lianga. These institutions provided the educational settings for examining academic success among Bachelor of Elementary Education students during the academic year 2025–2026.

2.3 Respondents of the Study

The respondents comprised 470 second-, third-, and fourth-year Bachelor of Elementary Education students from a total population of 1,396 enrolled students. This sample size was considered adequate for SEM, consistent with research suggesting that approximately 400 respondents can satisfy its statistical requirements (Gumasing & Niro, 2023). First-year students were excluded because they commonly experience transitional challenges, including academic stress and uncertainty (Mulaudzi, 2023; Chimenya, 2025). Including students with greater college experience helped minimize initial adjustment-related influences. Participation was voluntary and required informed consent.

2.4 Sample and Sampling Procedure

Proportional stratified random sampling was employed to ensure representation across participating campuses. The population was divided into institutional strata, and respondents were randomly selected according to each campus's enrollment proportion (Iliyasu & Etikan, 2021). The sample was determined using a 5% margin of error, 97% confidence level, and 50% population distribution. The allocation included 112 respondents from Bunawan (23.83%), 98 from Butuan City (20.58%), 60 from Tandag (12.77%), 73 from Tagbina (15.53%), and 127 from Lianga (27.02%). This procedure ensured proportional representation across the identified study locations.

2.5 Research Instrument

The study utilized five adapted standardized questionnaires. Cognitive engagement was measured using an 18-item instrument adapted from Barlow, Brown, and Lutz (2020), covering peer interactivity, constructive notetaking, active processing, active notetaking, and passive processing. Learning strategies were assessed through a 23-item instrument adapted from Neroni et al. (2019), measuring time and effort management, complex and simple cognitive strategies, peer interaction, and academic thinking. College adjustment was evaluated using a 20-item adaptation of the Student Adaptation to College Questionnaire developed by Baker and Siryk (1989), covering academic, social, emotional, and institutional adjustment. Academic motivation was assessed using a 15-item instrument adapted from Dişlen Dağgöl (2020), encompassing self-challenging, information use, and discovery. Academic success was measured through a 36-item instrument adapted from Orçanlı et al. (2021), covering general academic skills, internal motivation, personal adjustment, concentrated learning, external motivation, socializing, career decidedness, lack of anxiety, and related success behaviors. A five-point Likert scale was used, with mean scores interpreted as Very High (4.20–5.00), High (3.40–4.19), Moderate (2.60–3.39), Low (1.80–2.59), and Very Low (1.00–1.79). The adapted instruments underwent expert validation and pilot testing. Cronbach's alpha coefficients demonstrated satisfactory to excellent reliability: cognitive engagement (.879), learning strategies (.906), college adjustment (.924), academic motivation (.905), and academic success (.967).

2.6 Data Gathering Procedure

Following expert validation, the researcher requested authorization from the Commission on Higher Education (CHED) Caraga Regional Director, university presidents, and college deans. Upon approval, questionnaire administration was scheduled across participating institutions. Respondents received instructions and clarification, including vernacular explanations when necessary. Completed questionnaires were retrieved on the same day, organized, tallied, and forwarded to the statistician for analysis.

2.7 Data Analysis Techniques

Descriptive statistics were used to summarize the levels of cognitive engagement, learning strategies, college adjustment, academic motivation, and academic success. Pearson's product-moment correlation coefficient determined the strength and significance of relationships among the variables, while linear regression identified significant predictors of academic success (Turney, 2024). Structural Equation Modeling examined the hypothesized relationships and determined the best-fit structural model. Model adequacy was evaluated using established fit indices (Obieniu and Amadin, 2025). Acceptable model fit required a chi-square-to-degrees-of-freedom ratio (CMIN/DF) below 2.00, a p-value above 0.05, and Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Goodness-of-Fit Index (GFI), and Normed Fit Index (NFI) values of at least 0.95. Additionally, the Root Mean Square Error of Approximation (RMSEA) was required to be below 0.05, with PCLOSE exceeding 0.05.

2.8 Ethical Considerations

The study adhered to the ethical standards of the University of Mindanao Ethics Review Center (UMERC), under Protocol No. UMER-C-2024-008. Participants provided informed consent after receiving information about the study's purpose, procedures, and voluntary nature. They were assured of their right to withdraw without consequences. Confidentiality, secure data handling, and protection against data falsification were observed in accordance with the Data Privacy Act of 2012. All collected information was intended exclusively for academic purposes.

3. Results and Discussion

3.1 Levels of Cognitive Engagement, Learning Strategies, College Adjustment, Academic Motivation, and Academic Success

3.1.1 Cognitive Engagement

The respondents demonstrated a very high level of cognitive engagement ($M = 4.27$, $SD = 0.462$). Constructive notetaking obtained the highest mean (4.33), followed by active processing (4.27), while peer interactivity, active notetaking, and passive processing each recorded 4.25. These findings indicate consistently high cognitive involvement across all measured dimensions. The findings suggest that students actively organize, elaborate, and integrate academic information rather than merely receive it. This supports Siegel (2025), who emphasized meaningful notetaking, and Voyer et al. (2022), who associated deeper learning with conceptual understanding. Similarly, Fiorella and Mayer (2021) and Chi and Wylie (2021) highlighted the importance of generative learning and constructive engagement in developing meaningful knowledge.

3.1.2 Learning Strategies

Learning strategies obtained a very high overall mean ($M = 4.32$, $SD = 0.390$). Simple cognitive strategy use ranked highest (4.35), followed by complex cognitive strategy use (4.33), time and effort management (4.32), contact with others (4.30), and academic thinking (4.29). All indicators were interpreted as very high. These results indicate that students regularly organize information, connect new concepts with prior knowledge, and apply cognitive and self-management strategies. The findings align with Zambrano et al. (2021) and Fiorella and Mayer (2021), who emphasized elaboration and knowledge integration. Likewise, Heller and Matzger (2023), Schneider and Preckel (2022), and Theobald et al. (2021) highlighted the contributions of collaborative, active, and strategic learning to academic performance.

3.1.3 Adjustment to College

The respondents exhibited a very high level of college adjustment ($M = 4.34$, $SD = 0.369$). Institutional attachment recorded the highest mean (4.42), followed by emotional adjustment (4.37), social adjustment (4.30), and academic adjustment (4.27). These results reflect strong institutional belonging and favorable adaptation to college demands. The findings suggest that institutional attachment, positive social relationships, and emotional stability contribute to students' favorable college experiences. This agrees with Nabi et al. (2024), who emphasized institutional fit and student well-being, and Kahu et al. (2023), who associated institutional belonging with student engagement and persistence. Similarly, Alam et al. (2021) and Baber (2022) emphasized supportive learning environments and interpersonal interactions in promoting student satisfaction.

3.1.4 Academic Motivation

Academic motivation registered a very high overall mean ($M = 4.32$, $SD = 0.43$). Information use obtained the highest mean (4.35), while self-challenging recorded the lowest (4.29). All three dimensions, including discovery, were classified as very high, indicating consistently strong motivation among respondents. These findings reflect students' curiosity, persistence, satisfaction with learning, and willingness to apply acquired knowledge. Sukor et al. (2021) associated positive learning perceptions with educational satisfaction, while Tian et al. (2021) emphasized accomplishment as a contributor to well-being. Similarly, Martin and Bolliger (2022) identified student satisfaction as an important indicator of meaningful educational experiences.

3.1.5 Academic Success

Academic success obtained a very high overall mean ($M = 4.31$, $SD = 0.323$). General academic skills ranked highest (4.39), followed by internal motivation (4.36) and perceived instructor efficacy (4.35). Personal adjustment (4.33), external motivation and socializing (4.31 each), concentration (4.27), career decidedness (4.23), and lack of anxiety (4.20) were likewise rated very high. These results indicate that students demonstrated effective academic preparation, concentration, self-management, and goal-oriented behaviors. The findings support Panadero (2021), who emphasized self-regulated learning, and van der Stel and Veenman (2021), who highlighted metacognitive skills. Similarly, Carpenter et al. (2022), Agarwal et al. (2021), and Dunlosky and Rawson (2021) emphasized strategic preparation, focused review, and evidence-informed learning practices in supporting academic achievement.

3.2 Relationships Between the Predictors and Academic Success

3.2.1 Cognitive Engagement and Academic Success

Cognitive engagement demonstrated a statistically significant but weak positive relationship with academic success ($r = .221$, $p = .000$). Individual cognitive engagement indicators showed correlations ranging from .095 to .256 with overall academic success. The null hypothesis was rejected at the 0.05 significance level. This finding suggests that greater cognitive involvement is associated with favorable academic outcomes, although the relationship is relatively weak. Bond et al. (2021) and emphasized the importance of active information processing and meaningful participation, while associated cognitive engagement with self-regulation, persistence, and critical thinking.

3.2.2 Learning Strategies and Academic Success

Learning strategies exhibited a statistically significant positive relationship with academic success ($r = .435$, $p = .000$). Individual learning strategy indicators showed significant correlations ranging from .274 to .323 with overall academic success. The null hypothesis was rejected. The findings indicate that effective learning strategies are associated with better academic outcomes through organized study practices, self-regulation, and purposeful learning. This supports Donker, de Boer, Kostons, Dignath-van Ewijk, and van der Werf (2021), who emphasized strategic learning behaviors, and Xu, Duan, Padua, and Li (2022), who highlighted self-regulated learning as an important contributor to academic achievement.

3.2.3 Adjustment to College and Academic Success

Adjustment to college showed a statistically significant positive relationship with academic success ($r = .406$, $p = .000$). Correlations between individual adjustment indicators and overall academic success ranged from .221 to .351, with all relationships significant at the 0.05 level. Consequently, the null hypothesis was rejected. These findings suggest that students who successfully manage academic, social, emotional, and institutional demands tend to demonstrate better academic outcomes. Hassan (2023) emphasized the relationship between academic adjustment and achievement, while Vergara and Balquedra (2024) associated inadequate adjustment with unfavorable academic performance. Poquet et al. (2021) further highlighted the importance of university adaptation to academic functioning, social integration, and psychological well-being.

3.2.4 Academic Motivation and Academic Success

Academic motivation demonstrated the strongest overall correlation with academic success among the four predictors ($r = .519$, $p = .000$). Its three indicators showed significant correlations ranging from .381 to .439 with overall academic success. The null hypothesis was rejected at the 0.05 significance level. The findings suggest that motivated students demonstrate greater persistence, academic participation, and commitment to educational goals. This aligns with Çali et al. (2024), who emphasized academic engagement and interest, and Centina and Guhao (2022), who identified motivation as an important behavioral force directing individuals toward competence and achievement.

3.3 Structural Equation Modeling of Academic Success

3.3.1 Initial Structural Model

The initial structural model examined cognitive engagement, learning strategies, adjustment to college, and academic motivation as predictors of academic success. The model demonstrated inadequate fit, with $CMIN/DF = 4.355$, $GFI = .821$, $CFI = .700$, $NFI = .646$, $TLI = .662$, $RMSEA = .085$, $PCLOSE = .000$, and $p = .000$. None of the reported indices satisfied the prescribed goodness-of-fit criteria. These results indicate that the initial configuration did not adequately represent the observed relationships among the study variables. Consequently, model refinement was necessary to identify a more suitable structural representation of academic success.

3.3.2 Revised Structural Model

The second model retained three cognitive engagement indicators, three learning strategy indicators, two college adjustment indicators, all three academic motivation indicators, and nine academic success indicators. Model fit improved slightly, with $CMIN/DF$ decreasing to approximately 4.29, GFI increasing to .865, CFI reaching .746, TLI reaching .698, and $RMSEA$ decreasing to .084. However, the model remained outside the acceptable fit

thresholds. Although removing weaker indicators improved several fit indices, the revised model remained statistically inadequate. These findings justified further refinement to establish a structural model that more closely represented the observed data.

3.3.3 Final Best-Fit Structural Model

The third model achieved acceptable goodness-of-fit indices, with CMIN/DF = .845, $p = .685$, GFI = .991, CFI = 1.000, NFI = .971, TLI = 1.010, RMSEA = .000, and PCLOSE = .999. The model retained constructive notetaking and active processing for cognitive engagement; simple cognitive strategy use and academic thinking for learning strategies; institutional attachment and emotional adjustment for college adjustment; and information use and discovery for academic motivation. These results established Model 3 as the best-fitting model among the three evaluated alternatives. The findings are consistent with the framework of Barry Zimmerman known as Self-Regulated Learning (SRL) Theory (1986), which emphasizes the regulation of cognitive, motivational, and behavioral processes in academic achievement. The final model suggests that academic success involves interconnected learning and motivational characteristics, providing a basis for understanding the academic experiences of college of education students.

3.3.4 Explained Variance in Academic Success

The final structural model explained 32.5% of the variance in academic success ($R^2 = .325$). Cognitive engagement, learning strategies, adjustment to college, and academic motivation collectively accounted for approximately one-third of the variation in academic success, while the remaining 67.5% was unexplained by the model. This finding indicates that the four constructs collectively contribute to explaining academic success, although other factors outside the model may also be relevant. The result is consistent with Sinkkonen and Tapani (2024), who emphasized the importance of intentional engagement, active participation, and strategic learning behaviors in academic achievement.

3.4 Direct Effects of Cognitive Engagement, Learning Strategies, College Adjustment, and Academic Motivation on Academic Success

3.4.1 Learning Strategies as a Predictor of Academic Success

Learning strategies demonstrated a statistically significant positive direct relationship with academic success ($\beta = .262$, CR = 2.385, $p = .017$). This finding identifies learning strategies as one of the two significant direct predictors in the final structural model. The result suggests that effective planning, information organization, comprehension monitoring, and self-regulated study behaviors are associated with improved academic outcomes. This agrees with Theobald (2021), whose meta-analysis emphasized the contribution of self-regulated learning interventions to academic performance, learning strategies, and motivation.

3.4.2 Academic Motivation as a Predictor of Academic Success

Academic motivation emerged as the strongest significant direct predictor of academic success ($\beta = .270$, CR = 2.334, $p = .020$). Its standardized coefficient was slightly higher than that of learning strategies, indicating the largest direct association among the four predictors in the final model. The findings suggest that students' willingness to learn, persistence, and commitment to academic goals are important contributors to academic success. This supports Okada (2023), whose meta-analysis identified positive associations between autonomous motivation, academic achievement, and student engagement.

3.4.3 Adjustment to College as a Predictor of Academic Success

Adjustment to college exhibited a positive but statistically nonsignificant direct relationship with academic success ($\beta = .167$, CR = 1.543, $p = .123$). Although college adjustment was significantly correlated with academic success, it did not independently predict the outcome when the other variables were included in the structural model. This finding suggests that college adjustment may be associated with academic success through other academic or psychological processes rather than through a significant direct pathway. Willems et al. (2021) similarly emphasized that relationships between academic adjustment and achievement may vary depending on students' motivational characteristics, learning strategies, and educational contexts.

3.4.4 Cognitive Engagement as a Predictor of Academic Success

Cognitive engagement demonstrated a positive but statistically nonsignificant direct relationship with academic success ($\beta = .030$, CR = 0.395, $p = .693$). Its standardized coefficient was the smallest among the four predictors, indicating that cognitive engagement did not independently predict academic success in the final model. The findings suggest that cognitive engagement may be more relevant when expressed through purposeful learning strategies rather than as an independent direct predictor. This interpretation aligns with Xu et al. (2022), who emphasized the contribution of self-regulated learning interventions and strategic learning behaviors to academic achievement.

4. Conclusion & Recommendations

The study revealed very high levels of cognitive engagement, learning strategies, adjustment to college, academic motivation, and academic success among college of education students in Caraga Region XIII. All four exogenous variables demonstrated significant positive relationships with academic success. Generated Model 3 emerged as the best-fit structural equation model, with academic success represented by external motivation and socializing; cognitive engagement by constructive notetaking and active processing; learning strategies by simple cognitive strategy use and academic thinking; college adjustment by institutional attachment and emotional adjustment; and academic motivation by information use and discovery. The findings emphasize that academic success is a multidimensional outcome associated with cognitive, strategic, adaptive, and motivational processes, with learning strategies and academic motivation emerging as significant direct predictors.

Higher education institutions may utilize the best-fit structural model to strengthen academic support programs and instructional practices. Academic administrators and instructors are encouraged to promote constructive cognitive engagement, learner-centered instruction, collaborative activities, reflective learning, and effective study strategies. Institutions may also enhance peer mentoring, student adjustment services, and career development initiatives to support academic persistence and professional readiness. Students are encouraged to maintain purposeful study habits, academic motivation, and active participation in learning activities. Future researchers may replicate the study in other educational settings and examine additional factors influencing academic success.

The study was limited to Bachelor of Elementary Education students from selected state universities in Caraga Region XIII, restricting the generalizability of its findings to other academic programs, institutions, and geographical settings. The structural equation model examined only cognitive engagement, learning strategies, adjustment to college, and academic motivation, excluding other potentially relevant factors such as socioeconomic conditions, teaching practices, institutional support, self-efficacy, study environment, and digital learning behaviors. Furthermore, the relatively modest explanatory contributions of the predictors indicate that academic success may also be associated with factors not included in the proposed model.

5. Compliance with ethical standards

The authors acknowledge the participation of Bachelor of Elementary Education students from three state universities in Caraga Region XIII, Philippines, and the cooperation of the participating institutions. Participation was voluntary, informed consent was obtained, and data were collected exclusively through non-invasive survey questionnaires, with confidentiality maintained through secure data handling and nondisclosure of personally identifiable information. The study adhered to the ethical standards of the University of Mindanao Ethics Review Center (UMERC), under Protocol No. UMERC-2024-008. The authors declare no conflict of interest. This study received no external funding.

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