Original Article

A structural model of college students' mathematics performance: the role of psychological, physiological, and psychosocial factors

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ABSTRACT

The study aimed to find the best-fit structural model to describe the mathematics performance of freshmen secondary education students majoring in mathematics concerning psychological, physiological, and psychosocial factors. Psychological factors were measured in terms of self-efficacy and attitudes toward mathematics, while physiological factors were assessed about nutritional status, and wellness and well-being. Psychosocial factors were measured in terms of math anxiety and math interest. A questionnaire was administered to 312 randomly selected mathematics teacher education students who have experienced struggles in their board examination performance. These students came from various higher education institutions in the Davao and the SOCCSKSARGEN (South Cotabato, Cotabato, Sultan Kudarat, Sarangani and General Santos City) regions. The validity and reliability of the questionnaire were established through factor analysis and an internal reliability test, respectively. The findings indicate that students exhibit strong performance in mathematics, possess moderate levels of psychological and psychosocial competencies, and maintain relatively healthy physiological statuses. Additionally, the results reveal a structural model depicting students' mathematics performance with psychological, physiological, and psychosocial factors, which can explain 78% of the data considered in the study. Higher educational institutions may enhance support for students' psychological and psychosocial skills and integrate health and wellness programs to boost their physiological status, given its impact on academic performance. Further research is encouraged to explore additional factors affecting academic success, aiming to develop a more comprehensive understanding of influences on students' performance.

Keywords: bioecological model of development, ecological system theory, structural equation modeling

INTRODUCTION

Students' performance in mathematics has dropped in the Philippines and other parts of the world. This problem is observable from national assessments (Susada 2018) to international examinations (Thomson et al. 2019). According to data from the Programme for International Student Achievement (PISA 2022) and the Trends in International Mathematics and Science Study in the United States of America (TIMSS 2019), most students around the globe are struggling to learn mathematics (OECD 2016). In the Philippines, this often translates to poor performance in board examinations, particularly in secondary education, for students, including those majoring in mathematics (Amanonce and Maramag 2020).

The difficulty of mathematics education has caught the interest of most professionals, policymakers, and even the media. As a result, the situation has become a topic of various public and political debates (Hauge and Barwell 2017). There was a discussion on what were the causes of the difficulty (Bakker et al. 2021). There were also differint perspectives on approaching mathematics instruction, as a product or a process (Susada and Baquiano 2015). Several investigations were conducted to determine the causes of the problem as well as possible solutions. For instance, students' poor performance may be related to educators' antiquated teaching approaches (Banerjee 2016), students' lack of basic math skills (Acharya 2017), and poor interest in mathematics (Bacsal et al. 2022). Experts researching the issue proposed a variety of solutions to eliminate or mitigate the problem, ranging from government programs (Slaughter et al. 2015) to classroom practices (Kerr et al. 2018).

It should be emphasized that these studies rarely combine characteristics to determine what is optimal for learners but instead profile individuals' learning styles and proceed with the proposed intervention. Most studies focus on a few components but fail to combine them to identify which factor influences mathematics learning most (Acharya 2017). It has to be noted that mathematics performance is significantly influenced by psychological factors such as students' attitudes towards the subject and their self-efficacy, with positive attitudes and high self-efficacy linked to better outcomes (Bandura 1997, Schunk 1995); psychosocial factors, including math interest and math anxiety, also play a crucial role, where interest promotes engagement and achievement, whereas anxiety impedes performance (Renninger and Hidi 2011); and physiological factors like nutritional status and overall well-being are foundational to cognitive function and academic performance, underscoring the importance of physical health in learning mathematics (Florence et al. 2008). While individual factors have been studied extensively in isolation, their collective impact and the interactions among psychological, psychosocial, and physiological factors remain underexplored, particularly among college students, especially those who are majoring in mathematics (Kerr et al. 2018). This study aimed to fill this gap by integrating concepts from ecological systems theory (Bronfenbrenner 1979) and the bioecological model of development (Bronfenbrenner and Ceci 1994), suggesting that individual development is the result of interactions between biological, psychological, and environmental factors to develop a structural model on students' mathematics performance that encompasses these multidimensional influences.

Given the struggle with the poor performance of secondary education graduates in mathematics board examinations in the Philippines (Amanonce and Maramag 2020), and recognizing that their overall mathematics performance often predicts success in these examinations (Gabasa and Raqueño 2021), this study aimed to accomplish the following objectives: to determine the level of mathematics performance among secondary mathematics education students based on their grades in the subjects of trigonometry, and college and advanced algebra; to describe their psychological status (in terms of attitudes towards mathematics and self-efficacy), psychosocial status (in terms of math interest and math anxiety), and physiological status (in terms of nutritional status, wellness, and well-being); and to develop a structural model that effectively predicts the mathematics performance of college mathematics education students considering psychological, physiological, and psychosocial aspects.

METHODS

Data Gathering Procedures

This study began by developing and piloting the research instrument to establish its validity and reliability. Following this initial step, ethical clearance was obtained from the ethics office of Davao Oriental State University. Subsequently, permission to conduct the study was requested from the heads of the selected tertiary educational institutions. Upon receiving the necessary approvals, the heads of the Bachelor of Secondary Education (BSED)-Mathematics programs were requested to arrange a meeting with the first-year students for data collection. During this meeting, the students were informed about the purpose of the study and were asked to provide their consent to participate. Those who chose not to participate were given the option to leave the venue. After obtaining consent, the research questionnaire was distributed to the respondents. The students were allowed to complete the questionnaire at their own pace. Furthermore, the grades of student respondents in college and advanced algebra, as well as trigonometry, were acquired from the registrar's offices of the respective institutions following official requests for this information. Once the data collection process was completed, the responses were tabulated and analyzed.

Research Design

This study employed a descriptive-correlational research design, primarily utilizing a cross-sectional, or one-shot, survey approach. This methodology enabled the researcher to collect data efficiently by administering a questionnaire to respondents at a single point in time (Lodico et al. 2010). The descriptive aspect of the study focused on assessing the respondents' levels of mathematics performance, psychological status, psychosocial status, and physiological status. Conversely, the correlational aspect was dedicated to exploring the intricate relationships among these variables to develop an optimal model predicting students' mathematics performance based on psychological, psychosocial, and physiological factors.

Respondents and Sampling Procedure

The study targeted first-year college students enrolled in compulsory BSED – Mathematics subjects, including college and advanced algebra, as well as trigonometry (CHED 2017), for the first semester of the 2022-2023 academic year. These participants, aspiring secondary education math teachers from various prestigious institutions across the Davao and the SOCCSKSARGEN (South Cotabato, Cotabato, Sultan Kudarat, Sarangani and General Santos City) regions of Mindanao, are distinguished by their challenging performance in teacher licensure examinations (PRC 2022). The selected institutions were: Davao Oriental State University in Mati City, Davao Oriental; University of Southeastern Philippines in Tagum City, Davao del Norte; Southern Philippines Agribusiness, Marine, and Aquatic School of Technology in Malita, Davao Occidental; Davao del Sur State College in Digos City, Davao del Sur; and King's College of Marbel, Inc. in Koronadal City, South Cotabato.

To accurately reflect the population, the Slovin's formula with a 5% margin of error determined a sample size of 312 out of 373 eligible first-year BSED math students from the aforementioned institutions. Stratified random sampling ensured equitable representation across these institutions, yielding participation as follows: 64 from 77 students at Davao Oriental State University, 72 from 88 at the University of Southeastern Philippines, 70 from 85 at the Southern Philippines Agribusiness and Marine and Aquatic School of Technology, 67 from 80 at Davao del Sur State College, and 39 from 43 at King's College of Marbel, Inc. The assessment focused on their academic performance in key mathematics courses namely college and advanced algebra, and trigonometry.

Research Instrument

This study utilized a self-made survey questionnaire rigorously tested for construct validity and internal reliability, exhibiting strong validity indicated by a Kaiser-Meyer-Olkin measure of 0.851 and a significant Bartlett's Test of Sphericity ($p<0.001$). It also displayed notable reliability with a Cronbach's alpha coefficient of 0.761. The questionnaire was structured into four distinct sections. The second section, consisting of 20 items related to psychological factors, divided evenly between self-efficacy and attitudes towards mathematics. This part requested respondents to indicate their level of agreement or disagreement with each statement. The third section, also comprising 20 items, dealt into physiological factors such as nutritional status, wellness, and well-being, asking respondents to assess their condition in relation to each statement. The final section explored psychosocial factors, with 20 items equally distributed between math anxiety and math interest. Here, respondents were again requested to state their agreement or disagreement with each pertinent statement.

Data Treatment

This study employed mean calculations to assess the mathematics performance and physiological, psychological, and psychosocial statuses of students. To further enrich the discussion on these dimensions, standard deviations were calculated, offering insights into the variability of students' psychological, psychosocial, and physiological states.

Moreover, the research framework incorporated latent variables, each associated with specific observed variables, to capture the multifaceted nature of student performance and well-being. Students' mathematics performance was evaluated based on their grades in college and advanced algebra, and trigonometry—courses that are compulsory for secondary education majoring in mathematics (CHED 2017). The psychological dimension was assessed through students' attitudes towards mathematics and their self-efficacy beliefs. Psychosocial status was gauged by examining math anxiety and interest in mathematics, while physiological status was determined by evaluating nutritional status, and overall wellness and well-being. Thus, in this study, there were three latent variables, each associated with two observed variables, making it suitable for a structural equation modeling (SEM) study (Kline 2015). Accordingly, SEM was employed to identify the most accurate model explaining students' mathematics performance, taking into account psychological, psychosocial, and physiological factors. Table 1 provides comprehensive criteria for model fitness in SEM. The initial survey garnered 312 responses; however, after excluding outliers, the analysis proceeded with 294 responses. These 294 responses satisfied multivariate normality test and non-multicollinearity test of the independent variables. These responses were instrumental in developing the optimal model to describe the intricate relationships between students' academic performance and their psychological, psychosocial, and physiological states. The data analysis and model development were facilitated using SPSS and AMOS Version 22, providing a robust foundation for understanding the determinants of students' mathematics achievement.

Table 1. Characterization of best fit model.

Types of Model Fit	Parameters and Criteria for Model Fit
Parsimonious Model Fit	CMIN/DF < 2.00
Absolute Model Fit	p-value > 0.05
	RMSEA < 0.05
	GFI > 0.95
Incremental Model Fit	CFI > 0.95
	TLI > 0.95
	NFI > 0.95

RESULTS

Student's Level of Mathematics Performance

Table 2 shows students' mathematics performance regarding their college and advanced algebra, and trigonometry grades. Generally, students have good standing as to their mathematics academic performance. Only 1.9% of the respondents was excellent, and around 7.4% had passing grades in both subjects. There was around 40% of the total respondents who had had a good standing in both subjects.

It further disclosed that students had an average mathematics performance. Students' distribution of their mathematics performance was similar to college and advanced algebra, and trigonometry. It further depicts that respondents of the study were successful in the subject.

Students' Level of Psychological Abilities, Psychosocial Skills, and Physiological Status

Table 3 displays that students have a moderate psychological ability, similar to their attitude towards mathematics. Some agree with statements about their attitudes towards mathematics, while others disagree with some descriptors. They disagree in considering mathematics an unimportant subject, while they agree to consider it useful. Moreover, they varied more in considering mathematics a more difficult subject than believing it is important and unpleasant. On the other hand, students have high self-efficacy. They rated high on their ability to handle whatever comes their way in their pursuit of learning mathematics. On the contrary, they rated lowest on their ability to handle unexpected events during mathematics learning. They also have varied responses, whether they would be calmed during difficulties. At the same time, they are more united to believe that they can find means to achieve their goals in learning the subject despite opposition.

Table 2. Level of student's mathematics performance.

Subject	Grade	Remarks	Frequency	Percentage	Mean
College and Advanced Algebra	1.00 – 1.25	Excellent	6	1.9	2.17, Good
	1.50 – 1.75	Very Good	76	24.4	
	2.00 – 2.25	Good	126	40.4	
	2.50 – 2.75	Satisfactory	81	26.0	
	3.00	Passing	23	7.3	
Trigonometry	1.00 – 1.25	Excellent	6	1.9	2.17, Good
	1.50 – 1.75	Very Good	76	24.4	
	2.00 – 2.25	Good	125	40.0	
	2.50 – 2.75	Satisfactory	82	26.3	
	3.00	Passing	23	7.4	

Table 3. Students' level of psychological abilities, psychosocial skills and physiological status.

Factors	Standard Deviation	Mean	Remarks
I. Psychological Ability	0.32	3.34	Moderate
A. Attitude Towards Mathematics	0.34	3.34	Moderate
B. Self-Efficacy	0.47	3.47	High
II. Psychosocial Skill	0.32	3.08	Moderate
A. Math Anxiety	0.49	3.01	Moderate
B. Math Interest	0.46	3.15	Moderate
III. Physiological Status	0.35	3.28	Somewhat Good
A. Nutritional Status	0.48	3.51	Good
B. Wellness and Well-being	0.40	3.16	Somewhat Good

Additionally, it portrays that students have moderate psychosocial abilities. Some students agree with some descriptors on psychosocial abilities, while others disagree. They even have opposing views about the anxiety they feel toward the subject. The least that they contested is whether or not they have made an effort to avoid mathematics subject. They highly debated their idea that it takes time to solve mathematical problems. They also had more varied responses to consider mathematics their worst subject than to consider it easy. On the other side, it further displayed that students were also divided on their interest in mathematics. Nevertheless, they agreed that mathematics is essential and difficult. However, they had the least contested to consider mathematics class as boring and necessary in a day. They have more varied responses about their like and dislike of the subject while feeling comfortable in mathematics class is the most unified response.

Finally, it depicted that students sometimes focus on their physiological needs. They generally often observed parameters on their nutritional status. They sometimes consumed unsaturated fats but often dark green or deep orange vegetables. Additionally, they were more varied in sugar and caffeine consumption than unsaturated fats. Conversely, it further showed that students sometimes observe descriptors about their wellness and well-being. Among descriptors, they had high-stress management, while maintaining ideal body weight was the least of their concern. This means they are not particular about their ideal weight but have great ability on stress-coping mechanisms. Students are more varied in maintaining their ideal body weight than being more anxious and upset. With this, students are not united in the notion that they must maintain their ideal body weight.

Structural Model of Students' Mathematics Performance

Figure 1 presents a best fit model to describe mathematics performance of respondents in terms of psychological, psychosocial, and physiological factors. This model can explain 78% of the data being considered. Psychological and psychosocial skills of students have a strong relationship, while their psychosocial and physiological attributes have a moderate relationship. The psychosocial abilities of students as well as their physiological status have a direct influence on their mathematics performance. On the contrary, psychological factors have inverse influence students' mathematics performance. Students with a high interest in mathematics and less math anxiety are expected to perform well in the mathematics classroom. Additionally, students who have good nutritional status, wellness, and well-being tend to perform better in mathematics. Lastly, students who have overconfidence and a negative attitude towards mathematics have poor performance in mathematics.

The nutritional status of students has a greater impact on their physiological status than their wellness and well-being do. Further, math interest contributed directly to the psychosocial status of students, while math anxiety has an inverse impact on the psychosocial status of students. Furthermore, the self-efficacy of students has a greater impact on their psychological abilities than their attitudes toward mathematics do. Lastly, mathematics performance is highly attributed to students' algebra grades than their trigonometry grades.

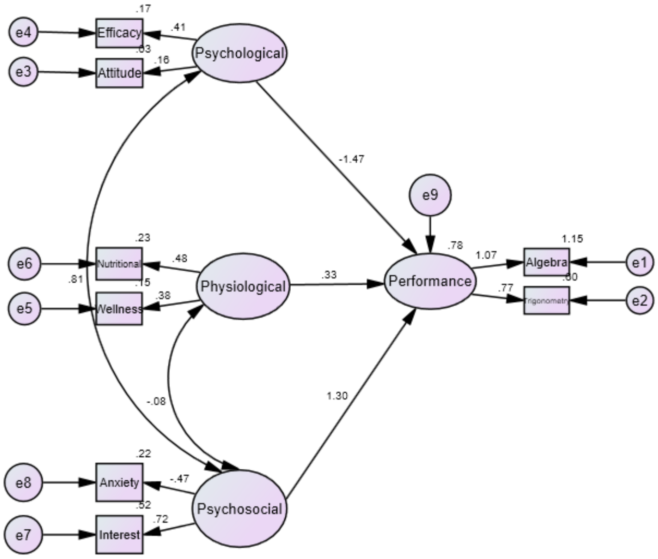

Figure 1. Structural model of students' mathematics performance (CMIN/DF=1.169, p-value=0.288, GFI=0.978, CFI=0.990, TLI=0.982, NFI=0.950, RMSEA=0.030).

DISCUSSION

Student's Level of Mathematics Performance

Mathematics education is vital for success in various fields. Students who have strong mathematical skills have high chance to pass any Philippine licensure examinations (Pantolla et al. 2016). The National Science Foundation revealed that mathematics provides the fundamental knowledge required for comprehending science, engineering, and technology (National Science Foundation 2013). Consequently, individuals who excel in mathematics are more likely to have better prospects for success in mathematics related areas (Slaughter et al. 2015). These findings can also guide teaching approaches and interventions to enhance math education within schools (Breslow et al. 2013).

Improvement in students' mathematics performance is significantly associated with academic self-concept and engagement in math-related activities. Identifying students who fall under the satisfactory and passing categories in Table 2 and providing them with the necessary support to enhance their mathematical abilities is essential. Baker's study further emphasizes the importance of addressing the psychological and psychosocial needs of highly motivated students with a positive attitude towards mathematics, as they tend to achieve higher academic success in this subject (Baker 2004). This observation is consistent with a study by Robertson et al. (2015), that students who excel in mathematics tend to have higher cognitive ability and stronger problem-solving skills.

Students' Level of Psychological Abilities, Psychosocial Skills, and Physiological Status

Table 3 shows students' psychological abilities, psychosocial skills, and physiological status with their math performance. The results showed that students had a moderate level of psychological ability (Mean = 3.34), indicating some proficiency in mathematical concepts and problem-solving (Lubans et al. 2016). However, there is still room for improvement as highlighted by previous literature (Wang et al. 2015). Most mathematics teacher education students need intervention to make the subject of mathematics enjoyable and important.

One crucial element of psychological ability is attitude, and the study found that students also had a moderate attitude toward mathematics (Mean = 3.34). A positive attitude towards math has been linked to increased motivation and performance (Wang 2013), but the moderate level suggests that there may be limitations in students' motivation and ability to succeed in the subject (Kerr et al. 2018). Moreover, the study also measured self-efficacy as another element of psychological ability (Mean = 3.47), suggesting that students believe they can perform well in math (Acharya 2017). High self-efficacy has been associated with improved academic performance (Bernardo 2021), indicating that interventions sustaining and enhancing self-efficacy levels could benefit students throughout their math education (Jett 2019).

The results indicated moderate psychosocial skills (Mean = 3.08). Math anxiety was one such psychosocial skill measured with an average score of 3.01 among students; this anxiety is a significant predictor of math performance (Waller 2014). It highlights the need for programs to manage math anxiety among students (Banerjee 2016).

Regarding physiological status, aspects like nutritional status and wellness and well-being were measured; they had mean scores of 3.51 and 3.16, respectively, indicating good nutritional status but somewhat good wellness/well-being levels among the student population were considered. It is essential to note that healthy living habits have been linked with academic performance (Marsigliante et al. 2023), and interventions promoting exercise and healthy eating could improve both physiological health and academic performance among students (Ghrouz et al. 2019).

Structural Model of Students' Mathematics Performance

Figure 1 portrays the structural equation model of student's mathematics performance in terms of psychological, physiological and psychosocial factors. This shows that students' mathematics performance is directly influenced by psychosocial factors (Waller 2014) and physiological factors (Baker 2004) but inversely affected by psychological factors (Wang 2013). Psychosocial, psychological and physiological elements have been found in studies to impact a student's mathematics ability in a multifaceted way. According to Zientek et al. (2019), psychosocial factors such as math interest and lower math anxiety can directly impact math performance. Moreover, Baker (2004) found that students' well-being influences their school performance. On the other hand, psychological factors can also negatively impact mathematics performance due to overconfidence (Zimmerman 2000) and negative attitudes towards mathematics (Beilock et al. 2010).

The model describes students' mathematics performance as influenced by biological, psychological, and environmental factors offers a holistic framework for enhancing educational outcomes. To improve math performance comprehensively, interventions should address these interconnected areas. Biologically, ensuring that students have access to proper nutrition can bolster cognitive functions crucial for learning mathematics, while incorporating regular physical activity can improve concentration and memory. Ergonomic classrooms also support physical well-being, helping students maintain focus during mathematical problem-solving. Psychologically, fostering a growth mindset can empower students to view challenges as opportunities for improvement, reducing the fear of failure often associated with math. Techniques to manage math anxiety, such as relaxation, exercises and supportive peer groups can create a more conducive learning environment. Personalized learning approaches that cater to individual learning styles and challenges can also make mathematics more accessible and engaging. Environmentally, creating a supportive learning atmosphere that encourages exploration and values effort over innate ability can significantly enhance student engagement and success in mathematics. Involving parents in educational processes and ensuring equal access to learning resources like textbooks and technology are critical for providing a supportive learning framework. By integrating strategies across these biological, psychological, and environmental dimensions, educators can not only improve math performance but also foster a supportive educational ecosystem that nurtures all aspects of student development. This comprehensive approach not only raises academic achievement but also equips students with the resilience and skills necessary to apply mathematical concepts to real-world situations.

The model also depicts that the psychological and psychosocial skills of students are strongly associated with each other. This implies that students with high psychological skills also have high psychosocial abilities (Bandura 1997; Renninger and Hidi 2011), and both these attributes can enhance students' mathematics performance (Di Martino and Zan 2011). It is reasonable to claim that improving the psychological abilities of students can also enhance their psychosocial capacities (Renninger and Hidi 2011), which can lead to overall improvement in their mathematics performance (Zimmerman 2000). However, the model also reveals that psychosocial and physiological factors were somewhat related to each other. According to Robertson et al. (2015), a significant association exists between psychosocial elements like math interest and math anxiety and physiological factors like nutrition, wellness, and well-being. These factors can impact a person's attitude and interest in mathematics, among other topics. This means that students' psychosocial abilities go along with their physiological status, which is consistent with Waller (2014) who showed that people with strong physiological attributes also have strong psychosocial capacities.

Increasing students' mathematics performance is a central discussion among mathematics researchers and educators. With the declining performances of students in mathematics, which leads to struggling performance in Filipino licensure examinations (Gabasa and Raqueño 2021), this study suggests another approach to addressing the problem. This study offers new insights into how to collectively and holistically address students' mathematics performance. Accordingly, educators must reduce students' math anxiety and increase their interest in the subject because these greatly contribute to their academic performance (Bacsal et al. 2022). Zhang et al. (2019) discovered that math anxiety negatively impacts academic performance, particularly in students with a poor interest in mathematics. The researchers concluded that reducing arithmetic fear and improving students' enthusiasm for mathematics could improve academic performance significantly. This study emphasizes the necessity of addressing math anxiety and interest to improve children's academic performance. Drigas and Pappas (2015) discovered that using math games in the classroom can raise students' interest and motivation in mathematics, leading to higher academic achievement. Enjoyable and engaging activities, such as math games, can help alleviate math anxiety and boost students' enthusiasm (Di Martino and Zan 2011).

Students' mathematics anxiety impacts their wellness and well-being, which has the greater contributory factor of physiological factors. Wang et al. (2015) discovered that math anxiety is connected with greater physiological arousal. These physiological responses can result in stress-related health problems, severely impacting students' wellness and well-being. Another study by Hill et al. (2016) discovered that math anxiety is associated with poorer cognitive flexibility and greater rumination. These cognitive aspects can contribute to negative thoughts and sentiments, such as self-doubt, as well as mental health issues, like sadness and anxiety, which can negatively impact students' wellness and well-being (Renninger and Hidi 2011).

Strengthening students' psychosocial abilities requires good physiological capacity. Marsigliante et al. (2023) discovered a clear association between physiological capability and the development of psychosocial abilities among students. Students with higher levels of physical fitness had stronger psychosocial qualities, such as high math interest and low math anxiety (Robertson et al. 2015). Physical fitness and psychosocial talents were mutually reinforcing because regular exercise improves physiological capacity, which improves psychosocial abilities (Waller 2014).

Several types of research have revealed that physical fitness is favorably related to students' psychosocial ability. Lubans et al. (2016) discovered, for example, that school-based physical exercise interventions improved children's psychosocial qualities such as self-esteem, resilience, and social competence. Ghrouz et al. (2019) discovered that regular exercise was connected with decreased feelings of depression and anxiety in students. Overall, these data indicate a substantial link between physiological capacity and the development of psychosocial capacities among students. Educators and parents can help students develop crucial psychosocial skills and traits by fostering physical fitness and supporting frequent exercise.

This study found a structural model of students' mathematics performance concerning physiological, psychological and psychosocial factors. The model depicts that students' mathematics performance is directly influenced by physiological factors (nutritional status, wellness, and well-being) and psychosocial abilities (math anxiety and math interest), but is inversely proportional to the psychological attributes of students (self-efficacy and attitudes towards mathematics). These findings suggest that a holistic approach to education reform is necessary—one that considers the physical, emotional, and psychological well-being of students as integral to mathematics success. Educational policies and practices should not only focus on the mathematics curriculum but also integrate support mechanisms that address the broader health and emotional needs of students. Schools could implement programs that integrate mental health services, nutritional counseling, and physical health activities into the regular mathematics curriculum, aimed at optimizing each student's potential for mathematics learning.

Overall, the structural model of this study highlights the multifaceted nature of factors affecting educational outcomes more particularly in mathematics and suggests that effective educational interventions need to be comprehensive, addressing more than just academic skills. This approach could help create a more supportive educational environment that promotes well-being and academic excellence in mathematics to boost the performance of secondary education students majoring in mathematics in their upcoming licensure examination for teachers.

The study considered only three latent variables, namely psychological (self-efficacy and attitudes towards mathematics), physiological (nutritional status and wellness and well-being), and psychosocial (math anxiety and math interest) factors. A study in the future is suggested to consider more latent and measured variables to make it more holistic and encompassing.

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ETHICAL CONSIDERATIONS

This study first secured ethical clearance from the Ethics Office of Davao Oriental State University before data collection. Respondents of the study are all of legal age because they are students of tertiary schools from selected institutions in Mindanao, Philippines. They were asked for consent to become respondents to the study. If anyone refused to become a respondent, they would not be given a survey questionnaire. The research questionnaire was given to them at their convenience, and they were also given the leverage of time to respond to it.

DECLARATION OF COMPETING INTEREST

The author declares no conflict of interest.

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