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COGNITIVE AND AFFECTIVE CHALLENGES OF HOSPITALITY MANAGEMENT STUDENTS IN MATHEMATICS IN THE MODERN WORLD: BASIS FOR AN INTERVENTION PLAN

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Abstract

Mathematics in the Modern World presents both cognitive and affective challenges for hospitality management students at Cagayan State University–Aparri Campus. This study aimed to identify these challenges using a descriptive-correlational quantitative design. A total of 187 BSHM students, selected through stratified random sampling, participated in the study during AY 2024–2025. Data were gathered using a validated researcher-made questionnaire and analyzed using mean, standard deviation, and inferential statistics. Results revealed that students frequently experience cognitive difficulties in applying mathematical concepts, logical reasoning, and problem-solving. Affective challenges included high math anxiety, low self-esteem, and negative attitudes toward mathematics. Younger students and those with weaker foundational math skills exhibited greater difficulties. Overall, both cognitive and affective factors hinder students' mathematical performance. The study concludes that targeted instructional strategies and emotional support are necessary, recommending student-centered approaches, confidence-building activities, and structured remediation to improve learning outcomes.

Keywords: cognitive challenges, affective challenges, math anxiety, mathematics in the modern world, hospitality management students

INTRODUCTION

Mathematics in the Modern World aims to enhance students' appreciation of mathematics and its real-life applications, regardless of their field of study. However, cognitive and affective challenges significantly influence students' academic progress and

future career skills, particularly among non-STEM learners such as Hospitality Management students. Despite its practical orientation, many students struggle with mathematical concepts and fail to see their relevance to their chosen field.

Globally, mathematics remains a challenging subject. The 2018 PISA results revealed that learners performed poorly in mathematics, while the 2019 TIMSS reported a decline in performance across participating countries, highlighting widespread concerns about mathematical literacy (OECD, 2019). These findings underscore the urgent need to strengthen mathematics education, especially at the tertiary level, to develop students' analytical and problem-solving skills.

At Cagayan State University–Aparri Campus, Hospitality Management students commonly exhibit anxiety, low interest, and limited engagement in mathematics. Cognitive challenges include difficulties in solving word problems, applying logical reasoning, and understanding abstract concepts, particularly when lessons are not directly related to their field. Many students struggle to recognize the relevance of topics such as coding and logic to their future careers. Additionally, weak foundational knowledge contributes to confusion and discouragement. Affective factors such as low self-esteem, fear of failure, and negative attitudes further hinder performance.

Mathematics anxiety is a significant barrier to learning. Students often enter college with pre-existing fear of mathematics, which negatively impacts their achievement. As noted by Carey (2019), anxiety contributes to a cycle of poor performance and increased avoidance. Similarly, self-efficacy plays a crucial role in academic success. Students with higher confidence are more likely to persist and perform better, while those who perceive themselves as incapable tend to disengage (Schunk & DiBenedetto, 2020).

This study is anchored in several theoretical and policy frameworks. Bandura's Social Cognitive Theory emphasizes self-efficacy as a key determinant of learning (Schunk & DiBenedetto, 2020). The study is also grounded in Republic Act No. 10533 and CHED Memorandum Order No. 20, Series of 2013, which highlight the importance of mathematics literacy across disciplines. The affective domain theory explains how attitudes and emotions influence learning (Krathwohl, 2019), while constructivist learning theory posits that students build knowledge based on prior experiences (Sfard, 2015).

Given these perspectives, the study aims to analyze the cognitive and affective challenges faced by Hospitality Management students in Mathematics in the Modern World and develop targeted interventions. While existing studies focus on STEM learners, limited research addresses non-STEM contexts, particularly in state universities. This gap highlights the need for evidence-based strategies to improve students' mathematical competencies, attitudes, and overall learning outcomes.

Statement of the Problem

This study investigated the cognitive and affective challenges encountered by Hospitality Management students in Mathematics in the Modern World. Specifically, it sought to answer the following questions:

1. What is the profile of Hospitality Management students in terms of:
 - a. Personal
 - i. Age
 - ii. Sex
 - b. Academic
 - i. Senior High School Academic Strand

- ii. Grade in the Last Mathematics Subject (grade 12-SHS)
 - iii. Study habits related to Mathematics
2. What are the challenges faced by the Hospitality Management students in Mathematics in the Modern World along the following aspects:
 - a. Cognitive
 - i. Understanding of mathematical concepts
 - ii. Mathematical background
 - iii. Problem-solving skills
 - iv. Logical reasoning ability
 - v. Computation skills
 - b. Affective
 - i. Mathematics confidence
 - ii. Mathematical anxiety
 - iii. Attitude toward mathematics
 - iv. Perceived relevance of mathematics in their field
3. What is the academic achievement of the Hospitality Management students in Mathematics in the Modern World?
4. Is there significant difference between cognitive and affective challenges of students when grouped according to their profile variables?
5. Is there a significant relationship between students' performance in Mathematics in the Modern World and their cognitive and affective challenges?
6. What intervention plan can be deduced from the findings of this study?

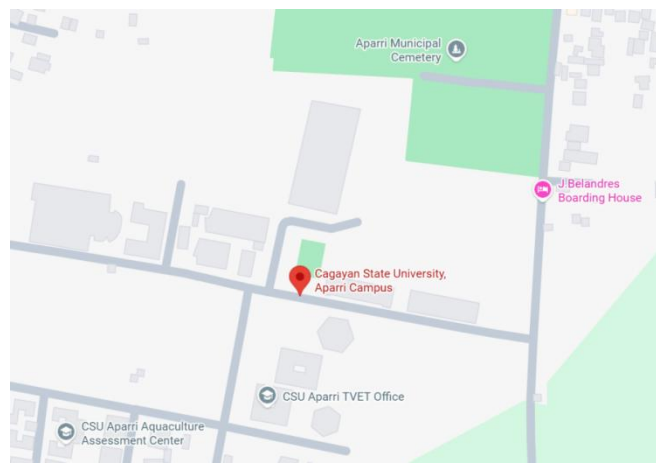
METHODOLOGY

Research Design

This study utilized a descriptive-correlational quantitative research design. It is descriptive as it sought to identify and characterize the cognitive and affective challenges faced by Hospitality Management students in Mathematics in the Modern World. It is correlational as it examined the relationship between these challenges and students' academic performance of the students. This design was appropriate because it allows for a comprehensive assessment of variables and their interconnections without manipulating the environment.

Locale of the Study

The research was conducted at Cagayan State University – Aparri Campus, focusing specifically on students enrolled in the Bachelor of Science in Hospitality Management program. Most of the students were not include to mathematics, only few took STEM and ABM during their senior high. There was a total of 363 students both regular and irregular students. This site was selected based on its accessibility, the researcher's institutional affiliation, and based on the observed academic difficulties of students in general education mathematics courses. The university presents a practical and contextually relevant setting for examining the challenges faced by learners and for proposing interventions that can be realistically implemented within similar academic environments.



Respondents and Sampling Techniques

The respondents for this study were students from the Bachelor of Science in Hospitality Management program who were enrolled in the subject Mathematics in the Modern World. The study utilized stratified random sampling, where each section of first-year Hospitality Management students served as a stratum. Proportional allocation was applied to determine the number of respondents per section using the Lynch formula. This ensured representativeness and minimized sampling bias.

Only students who were officially enrolled in MMW during the semester of data collection were included in the study. Those who dropped in the course were excluded, as their partial enrollment may not provide a full picture of the challenges being explored.

The final number of respondents was based on the total enrollment in MMW at the time of the study, with the goal of gathering a representative sample from each of the sections. Respondents were chosen among those students who have undergone MMW subject during their first year in College. Stratified random sampling was used to choose the respondents of the study. Of the 363 candidate respondents, the number of samples was reduced to 187 respondents as computed through Lynch formula.

$$n = \frac{Nz^2p(1-p)}{N\alpha^2 + z^2p(1-p)}$$

where n is the sample size that will be calculated given the following information:

N refers to the population size

α refers to the level of significance or the allowable sampling error

z refers to the value of the normal variables based on the confidence level

p refers to the largest possible proportion

Research Instruments

The main instrument used in this study is a structured questionnaire designed to collect relevant data aligned with the research objectives. The questionnaire was divided into three sections. Part I focused on gathering the demographic and academic profile of the respondents, including age, gender, year level, and previous performance in mathematics. Part II consists of likert-scale that was designed to assess cognitive challenges and includes items adapted from previously validated instruments related to understanding of mathematical concepts, mathematical background, problem-solving skills, logical reasoning ability, and

computation skills. Part III addressed affective challenges and consists of Likert-scale items measuring aspects such as confidence, anxiety, attitude toward mathematics, and perceived relevance of the subject.

To ensure the validity of the instrument, it was subjected to content validation by expert in mathematics education and research. It also underwent pilot-testing among students from the College of Information in Computing Science.

Data Gathering Procedures

The following steps were followed to ensure a systematic and ethical gathering of data for this study:

Prior to the actual data collection, the researcher conducted a pilot testing of the questionnaire among the first-year students of College of Information and Computing Science who were not part of the main study. The pilot testing aimed to assess the clarity, reliability, and validity of the items.

To ensure the compliance to institutional and ethical research standards, formal approval to conduct the study was obtained from the Graduate School, the College Dean of College of Hospitality Management, and from the office of the campus executive officer. Informed consent were also provided to prospective respondents. The consent form provided a clear explanation of the study's objectives, data gathering methods, voluntary participation, response confidentiality, and data privacy safeguards.

Students who volunteered to participate in the study were asked to complete a survey questionnaire provided via Google Forms. The survey link was sent out via the official group chat of the students. Participants were given enough time to complete the questionnaire according to their own schedule. To increase the response rate and ensure that the desired sample size was met, the researcher sent reminders on a regular basis and actively monitored response submissions during the data collection process.

All responses were thoroughly examined for completeness, consistency, and duplication after data collection was finished. During data cleaning, incomplete or erroneous entries were eliminated. After that, the completed dataset was exported from Google Forms and imported into Microsoft Excel, where it was labeled, arranged, and ready for statistical analysis.

Data Analysis Plan

Descriptive statistics (frequency, percentage, mean) were used to analyze students' profiles and the extent of their cognitive and affective challenges. Inferential statistics include:

ANOVA or t-test for determining significant differences across profile variables while Pearson correlation coefficient (r) for determining the relationship between academic performance and cognitive/affective challenges were employed ensuring first to satisfy assumptions needed to be met before the aforementioned tools were lined.

All tests were performed at a 0.05 level of significance.

The summary of surveys was also described through four-point rating scales which it was described as follows:

Scale	Statistical Limit	Descriptive Value
4	3.50-4.00	Always
3	2.50-3.49	Often

2	1.50-2.49	Sometimes
1	1.00-1.49	Never

Ethical Considerations

In conducting this study on the cognitive and affective challenges experienced by Hospitality Management students in Mathematics in the Modern World, strict ethical guidelines were followed to safeguard the rights and welfare of all participants. Each student was thoroughly informed about the purpose of the research to better understand the difficulties they face in learning mathematics and to explore possible ways to support their academic success. Students were given the assurance that participation in the study was entirely optional and that they could decline or leave at any moment without facing consequences. Prior to data collection, informed consent was acquired after participants were fully informed of the nature of their participation. To protect their privacy, every response were treated with strict confidentiality and anonymity, and no identifying information was included in the final report. Following the research method, the collected data was safely stored and properly disposed of. To ensure that the study followed institutional research norms, ethical clearance from the university's ethics review board was acquired where needed. These measures were put in place not only to fulfill ethical requirements, but to respect and uphold the dignity and well-being of each participant involved in the study.

RESULTS AND DISCUSSIONS

The following are the results and discussion as well as the interpretations of all pertinent data relative to this study.

Student's Profile Variables

Table 1a shows that most of the Hospitality Management students (158, 84.04%) are between 18-20 years old. This also shows that there are more female (137, 72.87%) than male students in the program. Many of the students were from the HUMSS (63, 33.51%) and TVL (75, 39.89%) strands, indicating that many of these students had no experience with advanced mathematics before entering college. With an overall mean of 87.97, their average grade in their most recent mathematics course suggests reasonable performance, indicating that although most students performed sufficiently, there is still opportunity for development in mathematical proficiency.

Table 1a. Students profile variables

Profile Variables	Frequency (n=188)	Percentage
Age		
18-20	158	84.04
21-23	24	12.77
24-above	6	3.19
Mean	19.9	
SD	4.07	
Sex		
Female	137	72.87
Male	51	27.13
Senior High School Academic Strand		

HUMSS	63	33.51
TVL	75	39.89
STEM	13	6.915
ABM	16	8.511
GAS	21	11.17
Grade in the Last Mathematics Subject		
90-above	64	34.04
85-89	93	49.47
80-84	31	16.49
Mean	87.97	
SD	3.52	

Student's Study Habits

Table 1b shows that students often practice positive study habits in mathematics, such as taking notes (3.11), reviewing lessons (2.51), and asking for help when needed (2.95) with category mean of 2.77. However, the category indicates that although study habits do exist, they might not be consistently rigorous or strategic enough to overcome cognitive difficulties. This validates the finding that in order to improve comprehension and application, students require organized study assistance and supervised practice. As stated by Capuno et al. (2019), students who had better study habits performed better in mathematics, indicating the importance of organized routines for studying will enhance their understanding and retention of topics.

Table 1b. Academic Profile of the students in terms of study habits

Statement	Weighted mean	Descriptive Value
1. I schedule regular time to study mathematics each week.	2.54	Often
2. I review my mathematics lessons even when there is no test.	2.51	Often
3. I finish math-related tasks on time.	2.89	Often
4. I take notes during mathematics class and revisit them.	3.11	Often
5. I ask questions to the teacher when I don't understand mathematics topics.	2.69	Often
6. I seek help or tutorials when I struggle in mathematics.	2.95	Often
7. I try to relate mathematics concepts to real-life situations.	2.73	Often
8. I use online resources or videos to improve my mathematics skills.	2.78	Often

9. I avoid procrastination in studying mathematics.	2.68	Often
10. I practice solving math problems outside of class requirements.	2.84	Often
Category mean	2.77	Often

Cognitive Challenges faced by the Hospitality Management students in Mathematics in the Modern World

Understanding of mathematical concepts

Table 2a presents the cognitive challenges of Hospitality Management students in understanding mathematical concepts, revealing an overall category mean of 2.87, signifies as Often. Many students responded that they need more time than others to comprehend math classes (3.00), indicating that they frequently require more assistance to fully understand mathematical concepts and take longer to process new knowledge. Furthermore, their responses show that they constantly have trouble with abstract ideas (2.77), suggesting that classes requiring for theoretical ideas and symbolic representations cause significant difficulties. These results suggest that students might rely more on memorization than conceptual understanding, which would restrict their ability to apply mathematical ideas in real-world or professional contexts. Effective learning happens when new information makes a meaningful connection with what students already know, according to Ornstein and Hunkins (2018). To improve students' conceptual grasp and encourage a deeper comprehension of mathematical concepts, teachers should prioritize contextualized examples and more lucid explanations.

Table 2a. Cognitive Challenges faced by the Hospitality Management students in Mathematics in the Modern World along Understanding of mathematical concepts

Statement	Weighted mean	Descriptive Value
1. I find abstract mathematical concepts difficult to understand.	2.77	Often
2. I need more time than others to understand mathematics lessons.	3.00	Often
3. I struggle to relate mathematics concepts to real-life applications.	2.90	Often
4. I often get confused by mathematical symbols and notations.	2.88	Often
5. I find it difficult to follow the logical flow of mathematics discussions.	2.83	Often
6. I find it challenging to learn new mathematics topics quickly.	2.94	Often
7. I forget concepts I learned even after repeated study.	2.80	Often
Category mean	2.87	Often

Mathematical background

Table 2b indicates that Hospitality Management students frequently experience cognitive challenges related to their mathematical background, reflected by the overall category mean of 2.75, signifies as Often. Numerous students stated that they lacked confidence in mathematics prior to entering college (2.82), indicating a persistent lack of confidence and unease about the topic. Furthermore, a number of students said that their senior high school mathematical background was not useful in their present course (2.72), suggesting that prior knowledge may not have adequately prepared them for more complex mathematical ideas in college. These results support McCormick's (2020) claim that complex or multi-step reasoning tasks are more difficult for students with poor mathematical backgrounds. The findings indicate that students' current comprehension and performance in MMW are still impacted by cumulative learning gaps. To improve overall comprehension and boost students' academic success in higher-level mathematics, it may be required to reinforce fundamental mathematical skills and go over fundamental high school subjects.

Table 2b. Cognitive Challenges faced by the Hospitality Management students in Mathematics in the Modern World along Mathematical background

Statement	Weighted mean	Descriptive Value
1. I lack a strong foundation in basic mathematics.	2.76	Often
2. I have trouble recalling high school mathematics concepts.	2.79	Often
3. I received low grades in my previous mathematics subjects.	2.71	Often
4. My SHS mathematics background does not helps me in Mathematics in the Modern World.	2.72	Often
5. I did not learn mathematics concepts in SHS that are relevant now.	2.70	Often
6. I was not confident in math before entering college.	2.82	Often
7. I did not understood math lessons well in high school.	2.75	Often
Category mean	2.75	Often

Problem-solving skills

Table 2c reveals that Hospitality Management students frequently encounter challenges in solving mathematical problems, with a category mean of 3.20, signifies Often. Students experience the most difficulty when applying mathematics to real-life situations (3.52) and when dealing with word problems and multi-step math problems (3.49). These findings imply that students find it more difficult to apply their knowledge beyond procedures they have memorized and to think critically. This habit implies a reliance on rote learning rather than analytical understanding. Meanwhile, verifying the correctness of their solutions (2.75) seems to cause them less difficulty, showing that their greatest

issue occurs not in checking their responses but in understanding and executing the problem-solving process itself. Schoenfeld (2016) stated that problem-solving is a gained process developed through guided practice, which underscores the necessity of systematic education and continuous exposure to reasoning-based activities.

Table 2c. Cognitive Challenges faced by the Hospitality Management students in Mathematics in the Modern World along Problem-solving skills

Statement	Weighted mean	Descriptive Value
1. I struggle to solve word problems.	3.49	Always
2. I get confused about which math method to use.	2.88	Often
3. I lack confidence in solving multi-step math problems.	3.49	Always
4. I have difficulty applying math to solve real problems.	3.52	Always
5. I don't know how to check if my solution is correct.	2.75	Often
6. I avoid answering math questions with problem-solving steps.	2.80	Often
7. I rarely get correct answers in math problem-solving.	3.48	Always
Category mean	3.20	Often

Logical reasoning ability

Table 2d shows that students continuously struggle with logical thinking with a category mean of 3.33 (Always). They regularly make logical mistakes (3.42) and also struggle with logic-based challenges (3.42), demonstrating that drawing conclusions and developing logical thinking are difficult undertakings. This implies that their prior educational experiences might have been more concerned with carrying out mathematical operations than with cultivating critical thinking abilities. On the other hand, they seem to find it easier to recognize patterns or sequences in issues (2.78), probably because these tasks are less abstract and more concrete. These results highlight the necessity of including critical analysis and logical reasoning into mathematics instruction in order to improve students' capacity for efficient information processing and evaluation.

Table 2d. Cognitive Challenges faced by the Hospitality Management students in Mathematics in the Modern World along Logical reasoning ability

Statement	Weighted mean	Descriptive Value
I struggle in logic-based math problems.	3.42	Always
I find it hard to follow steps in logical arguments.	3.41	Always
I get confused when solving logic-based equations.	3.42	Always

I lack confidence in my logical reasoning in math.	3.41	Always
I rarely identify patterns or sequences in problems.	2.78	Often
I often make logical errors in mathematics exercises.	3.42	Always
I find logical reasoning exercises stressful.	3.42	Always
Category mean	3.33	Always

Computation skills

Table 2e indicates that students frequently have difficulty with computation with category mean of 2.88 (Often). They rely significantly on calculators to carry out mathematical operations (3.07) and find calculating fractions and decimals challenging (3.17). This reliance may slow down their problem-solving process and raise anxiety because it indicates a lack of confidence and fluency in manual computation. On the other hand, basic operations and accuracy (2.73) present less of a barrier, suggesting that the difficulty increases with the complexity of numerical problems. Baroody (2017) asserts that mastery of fundamental operations lowers cognitive load, allowing up students to concentrate on reasoning rather than computation. This implies that in order to increase confidence and accuracy when solving issues, computational fluency requires reinforcement. Therefore, an important requirement for enhancing higher-level math performance is to increase computational accuracy and confidence.

Table 2e. Cognitive Challenges faced by the Hospitality Management students in Mathematics in the Modern World along Computational skills

Statement	Weighted mean	Descriptive Value
I struggle with basic operations in mathematics.	2.73	Often
I frequently make computation errors.	2.73	Often
I need a calculator for most mathematical problems.	3.07	Often
I feel nervous computing manually.	2.88	Often
I am slow in solving numerical problems.	2.84	Often
I have difficulty with fractions and decimals.	3.17	Often
I tend to guess answers instead of computing.	2.73	Often
Category mean	2.88	Often

Summary of Cognitive Challenges faced by the Hospitality Management students in Mathematics in the Modern World

Table 2f shows that students often (2.88) experience cognitive challenges in Mathematics in the Modern World. Among the five categories, logical reasoning (3.33) is the most difficult, indicating that students struggle to identify patterns, establish connections,

and draw valid conclusions. This reflects weaknesses in higher-order thinking skills needed for analysis and evaluation. Similarly, problem-solving skills (3.20) pose significant difficulty, as students find it hard to solve multi-step problems and apply mathematical concepts in real-life contexts. These findings support the theory of Schoenfeld (2016), which emphasizes that reasoning and problem-solving require guided and sustained practice. Meanwhile, mathematical background (2.75) shows moderate difficulty, suggesting that students possess basic knowledge but struggle with abstract reasoning. This aligns with the cognitive theory of learning (Bruner, 2016), which asserts that understanding develops through connections between concepts and experiences. Overall, students' difficulties lie in reasoning, interpretation, and application, highlighting the need for strategies that promote conceptual understanding and problem-based learning.

Table 2f. Summary of Cognitive Challenges faced by the Hospitality Management Students in Mathematics in the Modern World

Statement	Weighted mean	Descriptive Value
Understanding of mathematical concepts	2.87	Often
Mathematical background	2.75	Often
Problem-solving skills	3.20	Often
Logical reasoning ability	3.33	Often
Computation skills	2.88	Often
Category mean	3.01	Often

Affective Challenges faced by the Hospitality Management students in Mathematics in the Modern World

Mathematics confidence

Table 3a presents the affective challenges of Hospitality Management students in Mathematics in the Modern World along mathematics confidence, with an overall category mean of 3.13, signifies as Often. According to the results, students always doubts about their mathematical skills, especially when using mathematical formulas and that they are afraid to answer related questions (3.41). Also, students can't explain their ideas to others (3.42). These results show a great deal of hesitancy and self-doubt, which can keep students from participating completely in class activities or task in problem-solving. In contrast, fewer students agreed that they could not answer math problems even if they try hard (2.64), indicating that even when they usually try to solve problems, their performance is still affected by anxiety and low self-confidence. This is also supported by recent research, which demonstrates that students with low math self-efficacy avoid solving problems and contribute less to class discussions (Kim & Park, 2018). Similarly, Cai and Wang (2020) discovered that students who lack confidence in mathematics are more likely to have problem in understanding lectures because they feel they won't succeed before even trying. This demonstrates that confidence is crucial for both performance and the way students approach learning mathematics.

Table 3a. Affective Challenges faced by the Hospitality Management students in Mathematics in the Modern World along Mathematics confidence

Statement	Weighted mean	Descriptive Value
I cannot solve math problems even if I try hard.	2.64	Often
I don't feel confident using math formulas.	3.41	Always
I cannot explain math ideas clearly to others.	3.42	Always
I am afraid to answer math questions in class.	3.41	Always
I believe I will fail any math subject even if I put in effort.	2.73	Often
Category mean	3.13	Often

Mathematical anxiety

Table 3b shows the affective challenges of Hospitality Management

students in Mathematics in the Modern World along mathematics confidence, this implies that students frequently experience anxiety when engaging in mathematics related activities, as reflected by the overall category mean of 3.09, signifies as often. Many students reported feeling anxious when doing mathematical problems (3.43) and anxious when describing their solutions (3.43), suggesting that pressure and the fear of making mistakes have a significant impact on their performance. Even basic tasks may appear overwhelming due to this emotional distress, which can impair focus and working memory. However, although they seem to happen less frequently, feelings of worry when individuals don't understand a topic (2.81) still show stress throughout learning. This supports the findings of Ashcraft (2019), who discovered that math anxiety causes more mistakes and lowers concentration. Therefore, overcoming emotional obstacles is just as crucial as improving cognitive abilities.

Table 3b. Affective Challenges faced by the Hospitality Management students in Mathematics in the Modern World along Mathematical anxiety

Statement	Weighted mean	Descriptive Value
I feel nervous when solving math problems.	3.43	Always
I feel anxious when explaining math solutions.	3.43	Always
I feel stressed during math exams.	2.82	Often
I worry about failing math subjects.	2.94	Often
I feel panicked when I don't understand math topics.	2.81	Often
Category mean	3.09	Often

Attitude toward mathematics

Table 3c shows that students generally have a negative attitude toward mathematics with category mean of 2.82 that signifies often. Students frequently perceive mathematics as a dull and

challenging subject (2.77) and lack of motivation (3.15) and enthusiasm in mastering the subject. Which implies that their unfavorable opinion of the subject may cause them to avoid practice, which has an impact on understanding and memory. On the other hand, fewer students firmly agreed that mathematics is one of their least favorite subjects (2.74), suggesting that although general disinterest may not be universal, lack of enthusiasm is frequent. Long-term success in mathematics is strongly predicted by attitude, according to Ma & Kishor (2017). As a result, incorporating pertinent, interesting, and meaningful learning activities can enhance students' perspectives and cultivate a more favorable attitude toward mathematics.

Table 3c. Affective Challenges faced by the Hospitality Management students in Mathematics in the Modern World along Attitude toward mathematics

Statement	Weighted mean	Descriptive Value
I do not enjoy learning mathematics.	2.71	Often
Math is one of my least favorite subjects.	2.74	Often
I do not believe math is useful in daily life.	2.72	Often
I am not motivated to study math.	3.15	Often
I find math boring and uninteresting	2.77	Often
Category mean	2.82	Often

Perceived relevance of mathematics in their field

Table 3d shows that students often struggle to see how mathematics is related to hospitality professions with category mean of 2.89. Many students find it difficult to connect mathematical ideas with careers in the hospitality industry (3.44), suggesting that they believe mathematics has no bearing on their future employment. This perceived lack of relevance might result in low motivation, low interest, and little participation in class. Meanwhile, fewer students expressed doubt about the significance of mathematics in the hospitality industry (2.72), indicating that although they acknowledge its worth to some degree, they are unable to perceive its real-world applications. According to Prince (2020), learning takes on greater significance when students can identify how information connects to their career objectives. Therefore, students' appreciation and comprehension of the subject can be improved by contextualized training that connects mathematics lectures to real-world hospitality activities.

Table 3d. Affective Challenges faced by the Hospitality Management students in Mathematics in the Modern World along Perceived relevance of mathematics in their field

Statement	Weighted mean	Descriptive Value
I don't believe math is important in the hospitality field.	2.72	Often
I don't think I will use math in my future career.	2.74	Often
I find it hard to relate math to	3.44	Always

hospitality work.		
I am not interested in how math applies to my course.	2.75	Often
I don't understand why math is included in our curriculum.	2.79	Often
Category mean	2.89	Often

Summary of Affective Challenges faced by the Hospitality Management students in Mathematics in the Modern World

As shown in Table 3e, students often experience affective challenges in Mathematics in the Modern World, with a mean of 2.98. Among the areas, mathematics confidence (3.13) is the most difficult, indicating that many students doubt their ability to understand concepts and solve problems independently. This low confidence limits participation and persistence in challenging tasks. Attitude toward mathematics (2.82) also reflects a generally negative mindset, with students showing low interest, minimal enjoyment, and perceiving mathematics as difficult and boring. Such attitudes weaken engagement and perseverance in learning activities. As emphasized by Ma and Kishor (2017), students' mindset significantly influences their long-term success and interest in mathematics. Overall, affective challenges reveal that emotional factors, low motivation, and limited perceived relevance negatively affect students' engagement and performance, making it more difficult for them to succeed in the subject.

Table 3e. Summary of Affective Challenges faced by the Hospitality Management students in Mathematics in the Modern World

Statement	Weighted mean	Descriptive Value
Mathematics confidence	3.13	Often
Mathematical anxiety	3.09	Often
Attitude toward mathematics	2.82	Often
Perceived relevance of mathematics in their field	2.89	Often
Category mean	2.98	Often

Students Mathematics Performance in Mathematics in the Modern World

Table 4 indicates that the students generally performed at a satisfactory to very satisfactory level, as reflected in the overall mean grade of 87.9 with a standard deviation of 4.52. The majority of the respondents received grades between 86-90, indicating that even students face difficulties when learning MMW, they are still able to fulfill subject requirements and show a sufficient grasp of the topic. This result suggests that students need to work hard to complete academic requirements even when they find topics in mathematics challenging. Similarly, some research indicates that when practice, effort, and instructional assistance are provided, students can sustain good performance (Bernardo, 2019; De Corte, 2016). However, the existence of cognitive and affective difficulties in addition to their performance indicates that learning might not be easy, and ongoing assistance is important for boosting both proficiency and self-assurance in mathematics.

Table 4. Students Mathematics Performance in Mathematics in the Modern World

Grade	Frequency (n=188)	Percentage
75-79	3	1.596
80-85	59	31.38
86-90	71	37.77
91-95	51	27.13
96-above	4	2.13
Mean	87.9	
SD	4.52	

Comparison on the Cognitive and Affective Challenges in Mathematics in the Modern World when grouped according to profile

Table 5a shows that student capacity to handle cognitive activities in Mathematics in the Modern World seems to be influenced by their age, with younger students having more trouble organizing, processing, and comprehending mathematical concepts. Students find it more difficult to understand complicated or multi-step topics due to their relatively low level of academic maturity and exposure to fundamental. This is consistent with previous studies showing that younger students typically have more difficulty with higher-order cognitive processing because they have less past academic experience and are still developing their reasoning skills (Tosto et al., 2016). Overall, age-related differences indicate that students become more capable of handling the cognitive demands of mathematics as they get expose to mathematical task.

Considering students' preparation, practice, and learning discipline have a significant impact on their mathematics knowledge, students with poor study habits showed higher cognitive difficulties. Students seem to find it more difficult to retain concepts, evaluate problems, and follow mathematical discussions when they have irregular study schedules, little review time, and low engagement with learning resources. This result is consistent with Veloo and Khalid's (2017) emphasized that regular practice and organized study habits greatly improve comprehension and lessen cognitive challenge in mathematics.

Table 5a. Comparison on the Cognitive Challenges in Mathematics in the Modern World when grouped according to profile

Variables	V-value	P-value	Statistical Inference
Age	4.811	0.009	Significant
Sex	2.872	0.092	Not Significant
Senior High School Academic Strand	1.459	0.217	Not Significant
Grade in the Last Mathematics Subject	1.592	0.164	Not Significant
Study Habits	10.937	0.000	Significant

It can be seen in Table 5b that cognitive challenges in Mathematics in the Modern World vary according to student profile. Younger students exhibit more emotional difficulties, such as anxiety, hesitation, and discomfort, likely due to limited exposure and lower academic confidence. This supports Ramirez (2018), who found that younger learners display stronger emotional reactions to

challenging mathematical tasks. Female students also report greater affective difficulties, including anxiety and reduced self-confidence, aligning with Devine et al. (2018), who noted that females often experience more intense emotional responses despite strong performance. Additionally, students with poor study habits experience higher levels of stress, self-doubt, and low motivation. Inadequate preparation increases confusion and anxiety during problem-solving. This is consistent with Liem and Tan (2019), who found that poor study habits heighten negative emotions and avoidance. Overall, age, gender, and study habits significantly influence students' emotional experiences in mathematics.

Table 5b. Comparison on the Affective Challenges in Mathematics in the Modern World when grouped according to profile

Variables	V-value	P-value	Statistical Inference
Age	5.908	0.003	Significant
Sex	4.585	0.034	Significant
Senior High School Academic Strand	1.572	0.184	Not Significant
Grade in the Last Mathematics Subject	0.912	0.474	Not Significant
Study Habits	11.536	0.000	Significant

Correlation between students' performance in Mathematics in the Modern World and their cognitive and affective challenges

Table 6 present the correlation between students' performance in MMW and their cognitive and affective challenges, this shows a significant negative correlation. This implies that students who had more trouble processing information and comprehending mathematical ideas typically received lower grades. This is consistent with studies showing that cognitive obstacles limit mathematical thinking and problem-solving effectiveness, which lowers accomplishment (Phonapichat, 2016). The pattern suggests that improving performance results requires strengthening cognitive abilities. Overall academic performance seems to be hampered by problems including poor conceptual understanding, trouble adhering to logical structure, and a restricted capacity for making connections between ideas.

An increased level of anxiety, worry, or low self-esteem were frequently associated with lower academic performance, indicating that emotional stress interferes with concentration, memory, and perseverance when performing mathematical tasks. Anxiety, decreased engagement, and difficulty processing instructions can all be caused by negative emotions. Barroso et al. (2021) discovered a high correlation between worse academic performance and emotional distress in mathematics. Therefore, supporting students in their mathematical success requires addressing their emotional well-being.

Table 6. Correlation between students' performance in Mathematics in the Modern World and their cognitive and affective challenges

Grade	V-value	P-value	Statistical Inference
Cognitive Challenges	-0.311	0.000	Significant

Affective Challenges	-0.263	0.000	Significant
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*tested at 0.05 level of significance

Post Hoc Analysis of Cognitive Challenges of Hospitality Management Students When Grouped According to Profile Variables

Table 7 shows that age and study habits had a significant impact on the level of cognitive obstacles faced by Hospitality Management students in Mathematics in the Modern World. A significant difference was found among age groups ($F = 4.811$, $p = .009$), with students aged 21-23 and 24 and above attaining higher mean scores than those aged 18-20, implying that older students struggled more with logical reasoning, problem-solving, and mathematical application.

Study habits were identified as a very significant factor influencing cognitive challenges ($F = 10.937$, $p = .000$). Students categorized as Study Habit Level 4 had the highest mean score, indicating significantly greater cognitive difficulty than those in Levels 1, 2, and 3. The result shows that irregular or poor study routines impair capacity of the students to comprehend and apply mathematical concepts, underlining the need of structured and consistent study practices in overcoming cognitive challenges.

Table 7. Post Hoc Analysis of Cognitive Challenges of Hospitality Management Students When Grouped According to Profile Variables

Profile Variables	Mean difference	Mean	SD	F-value	p-value
Age					
18-20 (a)		2.9995	.38159	4.811	.009
21-23 (b)	> a	3.2469	.48312		
24-above (c)		3.2679	.59665		
Sex					
Female		2.9880	.38585	2.872	.092
Male		3.1737	.44607		
	Senior High School Academic Strand				
HUMSS		3.0737	.31152	1.459	.217
TVL		2.9665	.31038		
STEM		2.9796	.42305		
ABM		3.0476	.38668		
GAS		3.2143	.53548		
	Grade in the Last Mathematics Subject				
90-above		3.0138	.34830	1.592	.164
85-89		2.9964	.41483		
80-84		3.0921	.42170		
Study habits					

1		2.9955	.40634	10.937	.000
2		2.8587	.27704		
3	> 2	2.9986	.31422		
4	> 1, 2, 3	3.2923	.53002		

Post Hoc Analysis of Affective Challenges of Hospitality Management Students When Grouped According to Profile Variables

Table 8 shows that age, sex, and study habits all had a substantial impact on the affective challenges that Hospitality Management students faced. A significant difference in age was identified between groups (F value = 5.908, p value = .003), with students aged 21-23 and 24 and up indicating higher levels of mathematical anxiety, low confidence, and negative attitudes than those students aged 18-20. This implies that extended exposure to mathematical challenges may heighten negative emotional responses towards the subject.

Sex also showed a significant difference in affective challenges (F value = 4.585, p value = .034), with male students rated higher on average than female students, indicating greater emotional difficulty with mathematics. Furthermore, study habits were found to be very significant (F value = 11.536, p value = .000), with students in Study Habit Level 4 experiencing significantly higher affective challenges than those in more effective study routines. This demonstrates that poor study habits not only affect cognitive understanding but also increase negative emotions toward mathematics, emphasizing the importance of interventions that address both emotional support and study skill improvement.

Table 8. Post Hoc Analysis of Affective Challenges of Hospitality Management Students When Grouped According to Profile Variables

Profile Variables	Mean difference	Mean	SD	F-value	p-value
Age					
18-20 (a)		2.94	.360	5.908	.003
21-23 (b)	> a	3.21	.508		
24-above (c)		3.25	.739		
Sex					
Female		2.94	.373	4.585	.034
Male		3.12	.459		
	Senior High School Academic Strand				
HUMSS		3.03	.208	1.572	.184
TVL		3.01	.359		
STEM		2.92	.453		
ABM		2.97	.373		
GAS		3.17	.457		
	Grade in the Last Mathematics Subject				

90-above		2.95	.350	.912	.474
85-89		2.96	.373		
80-84		3.04	.469		
Study habits					
1		2.83	.289	11.536	.000
2		2.82	.271		
3		2.96	.341		
4	> 1, 2, 3	3.24	.513		

“MATH-BOOST Program (Building Outstanding Operations & Skills in Training): Strengthening Cognitive Skills and Confidence in Mathematics

I. RATIONALE

In Mathematics in the Modern World, hospitality management students frequently experience cognitive and affective difficulties, such as trouble grasping concepts, lack of effective problem-solving techniques, lack of confidence, and anxiety when doing computations or responding to questions. Students still perform well academically inspite of these challenges, showing that their abilities and self-assurance may greatly increase with the right help.

Through student-centered, activity-based, and course-relevant approaches that directly incorporate mathematical ideas into hospitality operations, MATH-BOOST seeks to address these issues. In order to connect abstract mathematics to practical professional situations, students will practice computations in real-life scenarios related to their course including estimating hotel occupancy and income, analyzing menu expenses, projecting event requirements, and managing inventories. The curriculum focuses on students’ cognitive mastery of mathematics as well as their

affective development, encouraging self-efficacy, motivation, and positive attitudes toward learning through a combination of guided instruction, peer-assisted learning, and confidence-building tasks. According to studies (Zakaria & Nordin, 2020), structured remedial programs that incorporate applied learning, peer support, and mastery-focused strategies greatly improve comprehension, lessen mathematics anxiety, and boost the confidence and engagement of students.

II. OBJECTIVES

MATH-BOOST emphasizes a strong importance on the two objectives of increasing confidence and mastering knowledge. In particular, the program aims to:

1. Determine students who have serious cognitive and affective difficulties through a diagnostic test.
2. Enhance conceptual knowledge and computational skills with interactive, contextualized, and guided learning exercises.
3. Engage applications that is related to hospitality management to improve analytical, thinking, and problem-solving abilities.
4. Using encouraging and engaging techniques, peer-assisted learning sessions, lessen arithmetic anxiety and boost confidence.
5. Promote positive attitudes about mathematics while emphasizing effective study strategies and self-directed learning approaches.

III. PROGRAM OF ACTIVITIES

MATH-BOOST will be applied over a 5-week period, consisting of diagnostic, remedial, peer-assisted, enrichment, and evaluation activities. Every week is devoted to particular objectives that are in line with the program's goals:

Week	Session	Description	Duration	Outputs
Week 1	Diagnostic Assessment	A diagnostic test will be given that covers fundamental computations, percentages, ratios, and scenarios involving problem-solving in the hospitality industry, such as figuring out hotel occupancy rates, menu item costs, and event inventory needs. Additionally, students will fill out a brief self-assessment survey about their attitudes toward math, math anxiety, and math confidence. Students will be categorized based on their affective requirements and cognitive gaps based on the results.	1.5 hours	1. Item analysis to identify areas for improvement in mathematics 2. Individual diagnostic profile of the students 3. List of at-risk math students (those below the 40th percentile) who will participate in MATH-BOOST
Week 2	Guided Remedial Sessions	Students move between four learning areas, each of which focuses on a fundamental idea: Center 1: Room income and discount promotions are calculated using basic calculations and percentages. Center 2: Exercises on ratios and proportions related to scaling menu items for events. Center 3: Fundamental algebra and cost forecasting and inventory needs	3 hours (45 minutes per center)	1. Finished worksheets with accurate computations and answers 2. Facilitator observation notes that record student participation, understanding, and areas that require improvement 3. Each student's participation

		<p>calculations.</p> <p>Center 4: Word puzzles and scenario-based activities that combine several ideas.</p> <p>Activities include group exercises, step-by-step explanations, guided examples, and immediate feedback.</p>		checklist for each center
Week 3	Workshops on Confidence and Peer Tutoring	<p>High-achieving students who serve as peer tutors facilitate small-group tutorials that go over remedial basics, explain challenging task, and show different approaches to problem-solving. Students work together to solve scenario-based tasks, discuss errors honestly, and explain calculations and procedures in basic, non-technical terms as part of confidence-building exercises. The focus is on lowering anxiety, boosting self-efficacy, and encouraging peer cooperation.</p>	3 hours	<ol style="list-style-type: none"> 1. Peer tutor records that summarize tactics, explanations, and common misconceptions addressed 2. Student reflection journals on concept comprehension and confidence growth 3. Notes from the facilitator regarding involvement, peer cooperation, and boosting confidence
Week 4	Math-in-Hospitality	<p>All previously acquired topics are connected into difficult real-world hospitality scenarios through instructor-led interactive workshops.</p> <ul style="list-style-type: none"> - Forecasting hotel occupancy and revenue using averages, percentages, and ratios - Event menu pricing and event planning using multi-step computations - Inventory control for food items and hotel supplies - Team demonstrations of problem-solving techniques, including justification and calculation procedures <p>In order to develop higher-order thinking, applied computation, and reasoning skills, students collaborate in groups to complete assignments, present solutions, and evaluate the reasoning of other groups.</p>	4 hours	<ol style="list-style-type: none"> 1. Finished group tasks demonstrating accurate computation and practical problem-solving 2. Group strategies that have been documented, along with detailed answers and justifications 3. Peer review forms that rate teamwork, accuracy, and clarity
Week 5	Post-Test and Culminating Activity	<p>Give a post-test to evaluate students' grasp of mathematical ideas. Organize a fun math competition where students work in groups to solve math problems related to hospitality and take part in problem-solving relays, showcasing their knowledge, logic, and confidence.</p>	3 hours	<ol style="list-style-type: none"> 1. Results from the post-test and a comparison with the pre-test scores 2. Results of the math challenge and team performance records 3. Awards for accomplishment and hard work 4. Student evaluations of their learning progress, confidence, and acquired skills

IV. EXPECTED OUTCOMES

Through the implementation of MATH-BOOST: Strengthening Cognitive Skills and Confidence in Mathematics, students should show notable improvements in their academic and affective domains. The objectives of the program is to increase students' confidence, motivation, and cooperative learning abilities while

also strengthening their grasp of basic mathematical ideas and their capacity to apply them in practical hospitality settings. The program is specifically intended to accomplish the following goals:

1. Improved mathematical competency to ensure that students will show greater calculation accuracy and a deeper mental grasp of mathematical concepts as

determined by post-tests in comparison to baseline diagnostic evaluations.

2. Enhanced thinking and problem-solving abilities so that students can apply mathematical ideas to real-life scenario related to hospitality management, like inventory forecasting, menu pricing, and hotel occupancy calculations.
3. Increased self-assurance and drive to ensure that students would exhibit less fear and a greater readiness to participate in mathematical tasks, communicate ideas, and try problem-solving on their own.
4. Using group projects, peer tutoring, and cooperative problem-solving sessions, students will develop their cooperation and peer-support abilities through active collaboration and peer learning.
5. Sustainable study habits that encourage long-term retention and mastery of mathematics by helping students adopt efficient study techniques for independent practice and knowledge application.

V. EVALUATION MECHANISM

To ensure both academic advancement and affective growth, the efficacy of MATH-BOOST will be evaluated using a variety of quantitative and qualitative metrics. Throughout the curriculum, cognitive performance, confidence, engagement, and learning behaviors will all be assessed. Among the methods of evaluation are:

1. Pre-test and Post-test Comparison that will assess baseline competencies and measure learning gains in mathematical skills.
2. Student Feedback Surveys to evaluate changes in confidence, math anxiety, and attitudes toward learning mathematics.
3. Teacher Observation to monitor student participation, problem-solving approaches, and collaboration during activities and workshops.
4. Attendance and Engagement Tracking to ensure students actively participate in all remedial, peer-assisted, and enrichment sessions.
5. Narrative and Photo Documentation to record detailed accounts of program activities, student interactions, and learning processes.
6. Grade Analysis to compare performance in midterm and final assessments to determine measurable improvements in academic achievement.

VI. PROJECT IMPLEMENTATION AND MANAGEMENT TEAM

Role	Person Responsible	Duties & Responsibilities
Project Leader	HM Program Coordinator	Directs and supervises the program; coordinates with faculty and administration
Peer Tutors	High-performing HM students	Facilitate small-group sessions, guide peers, and provide mentoring
Workshop	Mathematics	Conduct remedial and

Facilitators	Instructor	enrichment sessions; monitor engagement
Session Monitors	Mathematics Instructor	Oversee group activities, provide support, and record observations
Documentation Team	Student Council	Compile narrative reports, photos, and activity outputs
Consultant	Dean	Provide guidance, ensure alignment with institutional goals, validate outcomes

VII. RESOURCES AND SUPPORT REQUIREMENTS

1. **Venue:** College of Hospitality Management classrooms
2. **Technological Support:** Laptop, projector/Smart TV, printer
3. **Instructional Materials:** Worksheets, activity sheets, manipulatives for applied hospitality calculations
4. **Paperwork:** Attendance sheets, certificates, narrative reports
5. **Budgetary Requirements:**

Item	Unit Cost	Total
Printing of worksheets and modules	30	1,500
Snacks for workshops and peer tutoring	60	3,000
Certificates and recognition materials	20	1000
Activity materials (manila paper, markers)	10	500
Documentation printing and folders	8	400
Total Estimated Budget		6,400

VIII. CONTINUOUS QUALITY IMPROVEMENT

MATH-BOOST follows a Continuous Quality Improvement (CQI) approach. To determine strengths and areas for development, data from diagnostic and post-tests, student reflections, facilitator observations, and peer evaluations will be thoroughly examined. Activities and instructional tactics will be refined through regular interaction with professors, student leaders, and program coordinators. With this, every cycle will improve the program's efficacy, relevance, and sustainability while guaranteeing that students develop their mathematical skills and earn self-assurance for upcoming problems in hotel management.

Conclusions

Hospitality Management students experience cognitive and affective challenges in Mathematics in the Modern World, which are primarily influenced by poor logical reasoning, poor problem-solving skills, difficulty comprehending and applying mathematical concepts, and an insufficient mathematical background. These cognitive challenges can be triggered by affective challenges such as math anxiety, low confidence, low self-esteem, and negative attitudes toward mathematics. Younger students and those with irregular or poor study habits face greater hurdles, which have a negative impact on their involvement,

participation, and persistence in acquiring mathematical concepts. Overall, these issues undermine students' comprehension, confidence, and overall academic achievement in the course. These findings highlight how students' confidence and willingness to participate in mathematical activities are affected by the cognitive and affective challenges. Their overall academic performance in the class may be enhanced by developing both their emotional preparedness and cognitive skills.

Recommendations

In light of the findings and conclusions of the study, several recommendations are proposed. Mathematics instructors are encouraged to use contextualized and hospitality-related applications, along with step-by-step scaffolding, guided practice, visual aids, and low-stakes formative assessments to reduce anxiety and enhance students' problem-solving and conceptual understanding. The Dean and Program Coordinator may implement structured academic support such as short-term remediation programs, peer tutoring, and mathematics confidence-building workshops, focusing on students with weak foundations and high anxiety, particularly younger learners. Students are also encouraged to develop effective study habits, including regular review sessions, consistent practice, organized note-taking, and active participation in collaborative learning activities to lessen cognitive and affective challenges. Furthermore, future researchers may conduct intervention-based or experimental studies to evaluate the effectiveness of these strategies across different programs and strengthen evidence-based practices in teaching Mathematics in the Modern World.

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The author hereby declares that this article is her original work and that there is no conflict of interest.

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