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**RESEARCH ARTICLE**

# Behavior shift through non-traditional math teaching strategies integrating real-life transactions for non-math enthusiasts

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## ABSTRACT

This qualitative research explored how non-traditional teaching strategics encouraged non-math enthusiasts to engage in learning mathematics. The study purposively sampled ten (10) language majors from the College of Education and ten (10) hospitality management students. Through participatory and practical learning sessions, participants were encouraged to apply mathematical principles in a context that was significant to and meaningful to their everyday lives. The purpose of this study was to determine the effectiveness of these innovative strategies in fostering a positive attitude among students and increasing their understanding of the real-world applications of mathematics. Interviews found out that non-math enthusiasts were not engaging in learning mathematics because of several reasons *i.e.*, negative experience, perceived difficulty, perceived relevance, frustration. However, they also believed that developing non-traditional teaching strategies like interactive teaching methods and real-life problem applications can improve student's confidence and engagements in learning mathematics. The findings of the research might have an impact on teaching techniques and approaches intended to raise mathematical literacy across a range of demographic populations.

***Keywords:*** mathematical education; behavior shift; non-math enthusiast; real-life application

## 1. Introduction

In a world where being able to solve mathematical problems is becoming more and more necessary for success in many areas of life, there are a lot of people who consider themselves to be non-math enthusiasts. These people frequently find it difficult to make the connection between abstract ideas and practical applications when learning mathematics through standard methods of instruction. However, the secret to realizing their full potential is to find new methods to close the gap between academic understanding and real-world application.

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Dean[1] believed that students must understand the significance of mathematics. Because non-traditional activities were relating mathematics to something other than an assignment, they could aid students in realizing its importance. This was due to the fact that using actual data allowed students to investigate, learn, and provide or receive feedback on the significance of their justifications and suggested solutions[2].

By incorporating real-world transactions into the learning process, non-traditional strategies can change the attitudes of non-mathematicians toward mathematics. Similarly, Tularam[3] suggests that group work, discussion, and cooperative problem-solving lead to discourse, which is thought to be the most important aspect of the learning process. Alternatively, there is the philosophical position known as social constructivism, which holds that group work, language, and discourse are essential for learning within a cultural framework of the knowledge base[4]. These approaches are intended to improve mathematical understanding by making mathematical concepts more approachable and captivating, as well as to foster a deeper understanding of the role mathematics plays in daily life. Mathematics is a universal human endeavor and is not exclusive to any one nation, tribe, or country; rather, it is the product of humankind's combined efforts[5].

Changing behavior is a difficult process that frequently calls for creative approaches to successfully engage people who might not be inclined to using traditional methods. Introducing real-life transactions as a learning tool can be revolutionary, even for non-math enthusiasts. This shows that math teachers have a big part in their students' learning and that they should know what subjects the students should learn as well as how to push and encourage them to learn it[6]. For children who struggle with abstract concepts, including real-world arithmetic events into lectures can help make the topic more accessible and applicable. This method develops a greater appreciation for mathematics in students and helps them see how relevant math is to their everyday life. Teachers may help students change their behavior and adopt a more positive attitude toward mathematics by fostering a dynamic learning environment.

Recognizing that not all students will respond well to typical teaching methods—particularly those who find it difficult to relate mathematical concepts to real-world applications—is one of the core ideas behind these unconventional approaches. The traditional mathematics classroom is one where the teacher dominates communication during instruction and is seen as having possession or control over students' knowledge growth and development[7]. Practical applications and abstract mathematical concepts can be reconciled in the classroom by integrating real-world transactions. These unconventional approaches place a strong emphasis on practical application and hands-on learning, enabling non-math aficionados to use their mathematical knowledge in everyday situations. They have a deeper comprehension of mathematical ideas and increased self-assurance as a result.

This article explored strategies that have been shown to be successful in encouraging non-math enthusiasts to change their behavior. These strategies could include project-based learning, cooperative problem-solving exercises, and gamified learning environments. The objective was to improve non-math enthusiasts' mathematical skills and foster a good attitude toward mathematics. These strategies, which incorporate real-world transactions and useful applications, have the potential to profoundly alter people's behavior and attitudes toward mathematics and ultimately enable them to appreciate the beauty and practicality of this essential subject.

## 2. Research question

This study assessed different non-traditional teaching strategies that could potentially influence the perceptions of non-math enthusiasts about the significance of learning math. Specifically, this study sought to answer the following questions.

1. What were the visible behaviors manifested by non-math enthusiasts in learning mathematics?
2. What were the factors for negative behaviors of non-math enthusiasts in learning mathematics?
3. How teaching strategies encourage learning mathematics among non-math enthusiasts?
4. What non-traditional teaching strategies that can be linked to positive behavioral shift in learning mathematics?
5. What aspects of behavior shift was prominent in non-traditional teaching strategies?

# 3. Literature

## 3.1. Understanding the challenge

Non-math enthusiasts frequently find math difficult because they are not interested in the subject, have bad experiences with it, or think it has little purpose on their lives. Studies have indicated that students may not be successfully engaged by conventional teaching strategies[8,9]. This section explores the elements that lead to this way of thinking and emphasizes the necessity of using different strategies to interact with this audience.

## 3.2. Non-traditional strategies

This explores various kinds of non-traditional strategies that can be used to influence behavior and develop a favorable attitude towards math among those non-math enthusiasts. With encouraging outcomes, these tactics have been researched and used in educational contexts. There are a number of advantages and results that can result from using unconventional methods to modify the behavior of non-math enthusiasts. Using these strategies can boost motivation[10], enhance problem-solving and critical thinking skills[11], and help people understand the importance of math in everyday life[12].

## 3.3. Gamification

Using game-based learning platforms or gamification elements in math-related activities has been found to increase motivation and engagement among non-math enthusiasts[13]. Gamification aims to literally create a game out of learning by theming all components of your classroom in a game metaphor, making your class like one big first-person game. The research of Saleem[14] is thought to contribute significantly to studies on the use of gamification applications in online education.

## 3.4. Real-life transactions

It has been demonstrated that incorporating mathematics into everyday situations and activities, such as making a grocery budget or figuring out discounts, improves comprehension and appreciation of math in all facets of life[15]. Involving non-math enthusiasts in practical tasks that call for mathematical problem-solving abilities enhances critical thinking skills and fosters a positive attitude toward math[16].

## 3.5. Visual presentations

It has been demonstrated that using visual aids like graphs, charts, and diagrams improves non-math enthusiasts' understanding and memory of mathematical concepts[17]. This section, which draws from real-world experiences and success stories, presents cases in which unconventional tactics have successfully encouraged a change in behavior among non-math enthusiasts. These studies offer motivation and useful advice for teachers, parents, and others who wish to adopt comparable strategies[18].

The acceptance of non-traditional strategies that incorporate real-life transactions can facilitate a behavior shift among non-math enthusiasts towards an embrace of math. By making math relatable, engaging, and applicable to everyday life, we can cultivate a positive attitude towards the subject and enable individuals to acquire essential mathematical skills. These innovative approaches, bolstered by research and successful case

studies, will not only benefit non-mat enthusiasts but also contribute to a society that is more mathematically literate.

# 4. Methods

The research approach used to carry out this study is presented in this chapter. It explores the research design, study participants, data collection process, and data analysis.

### 4.1. Research design

This study adopts a qualitative research design, utilizing semi-structured interviews to explore The Behavior Shift through Non-Traditional Strategies Integrating Real-Life Transactions for Non-Math Enthusiasts.

### 4.2. Participants

For the study on The Behavior Shift through Non-Traditional Strategies Integrating Real-Life Transactions for Non-Math Enthusiasts, we conducted one-on-one interviews with a sample of Twenty (20) respondents. The participants were selected through purposive sampling to ensure diversity in College of Education Students (Language Majors) and Hospitality Management Students were the selected participants of this study.

# 5. Research instrument

The research instrument employed in our study was a survey questionnaire designed to assess and analyze The Behavior Shift through Non-Traditional Strategies Integrating Real-Life Transactions for Non-Math Enthusiasts.

**Table 1.** Instrument of the study.

| Objectives | Interview Questions |
|---|---|
| Determine behavior shift among Non-Math Enthusiasts Using Teaching | A. Are you familiar with the visible behavior manifested by non-math enthusiasts in your classes? Elaborate their observable behavior in Math classes. |
| | B. Based on your investigation, what are the factors why they become non-math enthusiasts? |
| | C. Can teaching strategies still change their behavior? Elaborate how in specific examples. |
| | D. Based on your experience in teaching non-math enthusiast students, what non-traditional teaching strategies can change their behavior in liking mathematics? |
| | E. What particular behavior or perceptions changed when you used these teaching strategies? Elaborate these changed traits of the students. |

# 6. Data gathering procedure

The data gathering procedure aims to investigate the Behavior Shift through Non-Traditional Strategies Integrating Real-Life Transactions for Non-Math Enthusiasts. The interviews will explore the factors that contribute to the Behavior Shift among Non-Math Enthusiasts Using Teaching Strategies from Real-Life Situations. The College of Education Students (Language Majors) and Hospitality Management Students are the selected participants of this study. Thematic analysis will be employed to identity recurring themes and

patterns within the data, allowing for a comprehensive understanding of the Behavior Shift through Non-Traditional Strategies Integrating Real-Life Transactions for Non-Math Enthusiasts.

# 7. Data analysis

The primary data in this study comprised the narratives obtained through interviews with the student who was selected as a participant of the Behavior Shift through Non-Traditional Strategies Integrating Real-Life Transactions for Non-Math Enthusiasts. The transcribed interview data will be coded and categorized, allowing for the identification of key themes related to the Behavior Shift through Non-Traditional Strategies Integrating Real-Life Transactions for Non-Math Enthusiasts. By analyzing the data, we aim to gain a comprehensive understanding of the underlying factors that impact the Behavior Shift through Non-Traditional Strategies Integrating Real-Life Transactions for Non-Math Enthusiasts.

# 8. Results

**8.1.** Question 1. What were the visible behaviors manifested by non-math enthusiasts in learning mathematics?

### 8.1.1. Disengagement

Seven (7) Respondents' instances state about the disengagement among individuals not enthusiastic about mathematics. This behavior was characterized by a lack of interest, active participation, or involvement in mathematical tasks or discussions. Observations revealed a tendency among non-math enthusiasts to mentally detach themselves from mathematical contexts, leading to limited engagement with related content or activities.

*"Based on experience these individuals often display signs of disengagement, such as a lack of participation in class discussions or activities, avoidance of math-related tasks, and an overall attitude of indifference or frustration towards the subject. During my math classes, these individuals often display signs of disengagement, such as a lack of participation in class discussions or activities, avoidance of math-related tasks, and an overall attitude of indifference or frustration towards the subject."*

*"As a Language Major student, I've observed distinct behaviors among non-math enthusiasts in our classes. Typically, they display visible signs of discomfort or disinterest during math sessions. These behaviors often include a lack of engagement with the material"*

### 8.1.2. Avoidance

Six(6) Respondents said in our study frequently employed avoidance tactics when faced with math-related challenges. These tactics included avoiding eye contact with instructors during math instruction, finding excuses to avoid math-related tasks, and displaying a reluctance to engage with mathematical content.

*"Yes, as a hospitality student based on observations, non-math enthusiasts in math classes often display visible behaviors such as disengagement, lack of participation, and frustration when faced with mathematical concepts. They may exhibit avoidance tactics, such as avoiding eye contact with the instructor or sitting at the back of the classroom. Additionally, they may express reluctance to ask questions or seek clarification, fearing judgment or embarrassment. Overall, this observable behavior in math classes tends to reflect a discomfort or unease with mathematical content, leading to reduced interaction and engagement in the learning process."*

*"Yes, I am familiar with the visible behaviors exhibited by non-math enthusiasts. They display visible behaviors such as disengagement, lack of participation, and frustration when faced with mathematical concepts. Exhibit avoidance tactics, such as avoiding eye contact with the instructor or sitting at the back of the classroom."*

### 8.1.3. Frustration and confusion

Seven (7) respondents state about the consistently exhibited signs of frustration and confusion when confronted with mathematical concepts or tasks. This frustration was evident through verbal expressions of frustration, such as sighing or expressing confusion, as well as non-verbal cues like furrowed brows and tense body language.

*"Non-math enthusiasts may exhibit frustration or confusion when attempting to solve mathematical problems, often accompanied by sighs or audible expressions of frustration."*

*"Yes, I am familiar with the visible behaviors exhibited by non-math enthusiasts they exhibit frustration or confusion when attempting to solve mathematical problems, accompanied by sighs or audible expressions of frustration."*

**8.2.** Question 2. What were the factors for negative behaviors of non-math enthusiasts in learning mathematics?

### 8.2.1. Negative experiences

Four (4) respondents said that the negative experiences were a significant factor contributing to their lack of enthusiasm for mathematics. These experiences ranged from difficulty understanding mathematical concepts to feelings of frustration and anxiety when engaging with mathematical tasks. Several participants expressed that past negative encounter with math, such as failed exams or embarrassing moments in class, influenced their perception of the subject negatively.

*"Next are negative past experiences. Previous struggles or failures in math classes can deter students from engaging with the subject further."*

*"Based on my experience as a Language Major student, several factors contribute to individuals becoming non-math enthusiasts, firstly, unfavorable prior experiences. Many individuals may have had negative experiences with math during their formative years, such as struggling to grasp concepts or facing harsh criticism from teachers or peers. These experiences can lead to a disinterest or even aversion towards the subject."*

### 8.2.2. Teaching methods

Four (4) respondents state the importance of effective teaching methods in influencing their attitude towards mathematics. They expressed a preference for interactive and practical approaches over traditional lecture-based methods.

*"The factors that contribute to why individuals in hospitality may become non-math enthusiasts…is teaching methods. Ineffective or uninspiring teaching methods can fail to capture students' interest and motivation to learn math."*

*"Based on my experience as a Language Major student, several factors contribute to individuals becoming non-math enthusiasts…instructional approaches. Ineffective instructional approaches can also contribute to a lack of enthusiasm for math. If instructors fail to engage students or make the subject matter accessible and relatable, students may become disinterested and disengaged."*

### 8.2.3. Limited exposure

Two (2) respondents of Hospitality Management students state that the limited exposure to mathematical concepts in their coursework, with only basic arithmetic being emphasized. Similarly, Language Major students indicated minimal exposure to math beyond basic requirements.

*"Lastly, limited exposure. Hospitality education may prioritize practical skills over mathematical concepts, resulting in limited exposure to math-related topics."*

**8.2.4. Perceived difficulty**

Five (5) respondents believed that mathematics as inherently difficult. This was prevalent among all participants. They cited complex problem-solving techniques and abstract concepts as major barriers to their engagement with the subject.

*"The factors contribute to why individuals in hospitality may become non-math enthusiasts so first is perceived irrelevance. Many hospitality students may perceive math as unrelated to their future careers, leading to disinterest in the subject."*

*"Next is perceived difficulty. Students may perceive math as inherently challenging, leading to avoidance behavior and a lack of enthusiasm towards the subject."*

*"Societal perceptions of math as difficult or uninteresting can influence individuals' attitudes towards the subject. Additionally, peer pressure and social norms may discourage some individuals from openly expressing an interest in math."*

**8.2.5. Perceived irrelevance**

Five (5) respondents said a common sentiment regarding the perceived irrelevance of mathematics to their respective fields of study. They noted a lack of connection between mathematical concepts and their future career paths.

*"The factors contribute to why individuals in hospitality may become non-math enthusiasts so first is perceived irrelevance. Many hospitality students may perceive math as unrelated to their future careers, leading to disinterest in the subject."*

*"...And a perception that math is irrelevant to their personal or professional lives."*

*"Secondly, Perceived lack of relevance. Some people may perceive math as irrelevant to their personal or professional goals, especially if they are pursuing fields that prioritize language and communication skills over quantitative abilities. They may fail to see the practical applications of math in their daily lives or careers."*

**8.3.** Question 3. How teaching strategies encourage learning mathematics among non-math enthusiasts?

**8.3.1. Employing engaging teaching strategies**

Six (6) respondents state that they exhibited apprehension towards mathematical concepts. However, after employing engaging teaching strategies such as real-life examples related to hospitality operations (e.g., revenue management calculations for hotel bookings), there was a noticeable improvement in their understanding and enthusiasm towards the subject matter.

*"Yes, teaching strategies can indeed change their behavior. One effective method is through ongoing professional development and training sessions tailored to introduce new instructional approaches or refine existing ones. For instance, educators may engage in workshops focused on incorporating technology in the classroom, differentiated instruction techniques, or culturally responsive teaching methods. These sessions provide educators with concrete strategies and resources, fostering a shift in their instructional practices. "*

*"As a hospitality student, I believe that teaching strategies can indeed influence and change behavior. One effective approach is through experiential learning, where students actively engage in real-world scenarios. For instance, in a restaurant management class, simulating customer service interactions can demonstrate the importance of communication and problem-solving skills. Additionally, incorporating case*

*studies highlighting ethical dilemmas in the industry can prompt critical thinking and shape ethical decision-making behavior."*

**8.3.2. Interactive activities**

Two (2) respondents state that the Interactive activities like group discussions and case studies tailored to hospitality scenarios facilitated deeper comprehension of mathematical principles. Consequently, these students displayed increased confidence and willingness to engage with mathematical content.

*"Yes, teaching strategies can indeed change their behavior. I do believe that fostering a supportive learning environment, teaching strategies can make meaningful behavior changes conducive to improved student outcomes."*

**8.3.3. Implementation of innovative teaching method**

Twelve (12) respondents state a lack of interest in mathematics, viewing it as unrelated to their field of study. However, through the implementation of innovative teaching methods such as linguistic-based problem-solving exercises (e.g., analyzing mathematical word problems in various languages), these students exhibited a shift in perspective, recognizing the applicability and relevance of mathematical concepts.

*"As a Language Major student, the question of whether teaching strategies can still influence behavior is a pertinent one. While behavior is often seen as deeply ingrained, effective teaching strategies can indeed lead to significant changes. One example is the use of positive reinforcement in language learning. By providing praise and rewards for desired behaviors, such as actively participating in class or completing assignments, instructors can motivate students to engage more fully with the material and develop better language skills."*

*"Yes, teaching strategies can indeed change their behavior. One effective method is through employing interactive and immersive learning techniques, such as role-playing exercises or language immersion programs, can encourage students to practice their language skills in real-world contexts, leading to more lasting behavioral changes. Ultimately, by tailoring teaching strategies to the needs and learning styles of individual students, educators can effectively shape behavior and facilitate meaningful learning outcomes."*

*"Teaching strategies can indeed influence and modify behavior, as they play a pivotal role in shaping individuals' learning experiences and outcomes. One example is through the implementation of active learning techniques, such as group discussions and problem-solving activities, which encourage student engagement and participation. By actively involving students in the learning process, teaching strategies can foster critical thinking skills, collaboration, and a deeper understanding of the subject matter."*

**8.4.** Question 4. What non-traditional teaching strategies that can be linked to positive behavioral shift in learning mathematics?

**8.4.1. Real-life scenarios and examples**

Sixteen (16) respondents state that the potential of real-life scenarios and examples in enhancing their liking for mathematics. They appreciated the practical relevance of applying mathematical concepts to situations encountered in the hospitality industry, which resonated with their professional interests.

*"As a hospitality student, I've found that incorporating real-life scenarios and examples from the hospitality industry can make math more relatable and engaging for non-math enthusiast students. Additionally, using hands-on activities, group discussions, and visual aids such as diagrams or infographics can help make abstract mathematical concepts more concrete and easier to understand. Encouraging a supportive and collaborative learning environment where students feel comfortable asking questions and exploring different problem-solving methods can also foster a positive attitude towards mathematics. Overall,*

*tailoring teaching methods to connect with students' interests and experiences outside of the classroom can significantly impact their perception and appreciation of mathematics."*

*"As a hospitality student, I've found that incorporating real-life scenarios and examples from the hospitality industry can make math more relatable and engaging for non-math enthusiast students. Using hands-on activities, group discussions, and visual aids such as diagrams or infographics can help make abstract mathematical concepts more concrete and easier to understand."*

*"Based on my experience, incorporating real-life examples and practical applications of math concepts can make it more relatable and engaging for non-math enthusiasts. Additionally, using hands-on activities, group discussions, and interactive games can help make learning math more enjoyable and less intimidating. Providing positive reinforcement and creating a supportive learning environment can also encourage students to develop a more positive attitude towards mathematics."*

*"As a language major student, I've found that integrating storytelling and real-world examples into math lessons can engage non-math enthusiast students effectively. By contextualizing mathematical concepts within narratives or everyday situations, students can better understand the practical applications and relevance of mathematics in their lives."*

**8.4.2. Integration of interactive activities**

Four (4) respondents said that they agreed on the positive impact of interactive activities in changing their behavior towards mathematics. They found that engaging in hands-on activities facilitated a deeper understanding of mathematical concepts and fostered a more positive attitude towards the subject.

*"As a hospitality student, I've found that encouraging a supportive and collaborative learning environment where students feel comfortable asking questions and exploring different problem-solving methods can also foster a positive attitude towards mathematics. Additionally, tailoring teaching methods to connect with students' interests and experiences outside of the classroom can significantly impact their perception and appreciation of mathematics."*

*"As a language major student, I've found that incorporating interactive activities, such as group discussions, games, or hands-on projects, can make learning math more enjoyable and foster a collaborative learning environment."*

**8.5.** Question 5. What aspects of behavior shift was prominent in non-traditional teaching strategies?

**8.5.1. Increased engagement**

Eight (8) respondents state that they displayed a notable increase in engagement with mathematics when presented with real-life scenarios relevant to the hospitality industry. They actively participated in discussions and demonstrated a willingness to explore mathematical concepts within practical contexts.

*"When employing various teaching strategies, I observed notable shifts in student behavior and perceptions. One evident change was an increase in engagement during class discussions and activities. Students appeared more willing to participate actively, demonstrating heightened confidence in expressing their thoughts and opinions."*

*"When employing various teaching strategies, I observed notable shifts in student behavior and perceptions. One evident change was an increase in engagement during class discussions and activities. Students appeared more willing to participate actively, demonstrating heightened confidence in expressing their thoughts and opinions."*

#### 8.5.2. Improved confidence

Four (4) respondents state that they exhibited enhanced confidence in their mathematical abilities after engaging with non-traditional teaching strategies. The application of mathematical concepts to real-world scenarios bolstered their self-assurance and willingness to tackle mathematical problems.

"*There was an evident enhancement in their communication skills, as they became more confident at expressing ideas and engaging in meaningful discussions. Moreover, their teamwork and collaboration improved noticeably, fostering a more cooperative learning environment."*

#### 8.5.3. Positive attitude shift

Eight (8) respondents State that there was a discernible shift in the attitudes of students towards mathematics. They expressed a newfound appreciation for the subject, recognizing its relevance in their future careers within the industry.

*"When implementing these teaching strategies, I observed a noticeable positive change in their problem-solving abilities, as they became more resourceful and analytical in addressing industry-related challenges. These teaching strategies facilitated the development of essential traits such as communication, teamwork, and problem-solving skills among hospitality students, ultimately better preparing them for success in the industry."*

*"When implementing these teaching strategies, I observed there was a noticeable improvement in their critical thinking skills, as evidenced by their ability to analyze and evaluate complex texts more effectively."*

*"When implementing these teaching strategies, I noticed a greater sense of collaboration among students, with an increased willingness to work together and support one another in their learning endeavors. In conclusion these teaching strategies fostered a more dynamic and interactive learning environment, contributing to the development of key traits such as engagement, critical thinking, and collaboration among students."*

## 9. Discussion

**9.1.** Question 1: What were the visible behaviors manifested by non-math enthusiasts in learning mathematics?

#### 9.1.1. Disengagement

The lack of enthusiasm and active participation in class discussions exhibited by non-math enthusiasts frequently causes them to get frustrated and uninterested in the topic. The research of Bergdahl[19] showed that teachers' judgments of students' engagement have an impact on both how they interact with students and their marks. Students who exhibit indicators of disengagement, such as avoiding math-related assignments, also frequently avoid these activities. This type of conduct is typified by a propensity to disengage mentally from mathematical contexts, which limits interaction with relevant materials or activities.

The results of Xue[20] are consistent with the present study. Learner disengagement is a persistent challenge in academic environments. Some factors seem worth considering by scholars to reduce learners' disengagement. These behaviors typically involve a lack of engagement with the material, such as obvious signs of discomfort or disinterest during math sessions, which point to the need for more focused support and engagement.

### 9.1.2. Avoidance

When challenged with mathematical topics, non-math enthusiasts in math classrooms frequently exhibit obvious characteristics like disengagement, lack of participation, and dissatisfaction. They might use avoidance strategies like sitting in the back of the classroom or avoiding making eye contact with the teachers. They could also show hesitation to seek clarification or ask inquiries out of fear of being judged or embarrassed. The findings were consistent with Tadayyon[21] where these observable behaviors indicate a discomfort or unease with mathematical content, which results in decreased interaction and engagement in the learning process. This lack of participation may irritate teachers, and it's possible that the only way to lessen this lack of participation is to understand the concept of avoidance strategy.

### 9.1.3. Frustration and confusion

The inability of non-math enthusiasts to solve mathematical problems frequently manifests as signals of irritation and insecurity. This frustration is shown in non-verbal cues like tense body language and furrowed brows, as well as verbal expressions like sighing or confusion. This theory is consistent with research by Richey et al.[22], which found that students in the incorrect example condition showed more confusion when navigating the course materials. Those who are familiar with the outward manifestations of non-math aficionados who frequently find difficulty with mathematical ideas or tasks may recognize these habits.

**9.2.** Question 2. What were the factors for negative behaviors of non-math enthusiasts in learning mathematics?

### 9.2.1. Negative experiences

A lack of enthusiasm for the subject can be greatly influenced by negative experiences with mathematics, such as frustration or difficulty understanding concepts. Consistent with research from O'Keeffe[23], student's negative experiences with math homework can compound intergenerational negative mathematical dispositions and identities. Students' opinions of a subject can be adversely affected by unpleasant experiences from the past, such as failing exams or awkward class situations. Aversion or disinterest in the subject might result from negative past experiences, such as receiving harsh criticism or having difficulty understanding concepts. These experiences can also discourage students from continuing to engage with the subject.

### 9.2.2. Teaching methods

The use of interactive and practical approaches to teaching mathematics is preferred over traditional lecture-based methods, as evidenced by the findings of Pech[24], which supports the idea that effective teaching methods have a significant impact on students' attitudes toward mathematics. Compared to social studies students, economics faculty students are more likely to favor active approaches. Ineffective or uninspired teaching strategies, which can fail to pique students' interest and enthusiasm, are among the factors that contribute to non-math enthusiasts in the hospitality industry. The findings transcend with that of Chavez et al.[25] that ineffective instructional strategies can also cause students to lose interest in math because they don't feel that their teachers are engaging them or making the material accessible.

### 9.2.3. Limited exposure

Limited exposure to mathematical concepts in coursework has been reported by students majoring in language and hospitality education; this finding is consistent with that of[26]. The students faced a number of challenges, including a lack of adequate teaching and learning facilities, limited exposure to the use of information, communication, and technology (ICT) as a pedagogical tool, and a general lack of infrastructure support during their stay in various host institutions. with an emphasis solely on fundamental math. Practical skills may take precedence over quantitative concepts in hospitality education.

### 9.2.4. Perceived difficulty

The study discovered that many people in the hospitality industry may stop being interested in mathematics because they believe it to be unimportant and difficult. These include the idea that math is irrelevant to vocations in the future, which might cause indifference, and the idea that math is a difficult topic. Similarly, Patall[27] suggested that students' perceptions of their teachers' autonomy support mitigated the decline in perceived competence and subsequent decline in engagement as a function of perceived difficulty. Peer pressure and social norms can also influence attitudes toward math, and societal perceptions of the subject as difficult or uninteresting.

Additionally, Murro[28] supported that cooperative process of continuous learning at home by giving them tangible homeschooling manuals, module guides, training, and programs. As a result, addressing these issues can assist people in overcoming these obstacles and cultivating a more favorable attitude toward mathematics.

### 9.2.5 Perceived irrelevance

Perceived irrelevance and perceived lack of relevance are the two main reasons why many hospitality students are not interested in math. Many students feel that math has no bearing on their future employment, which makes them uninterested[29]. Similarly, this study found out that for non-math enthusiasts, mathematics are *irrelevant* to their personal or professional lives, particularly if they are pursuing careers that value communication and language skills more than numbers. They may consequently find it difficult to use arithmetic in their daily lives or employment.

**9.3.** Question 3. How teaching strategies encourage learning mathematics among non-math enthusiasts?

### 9.3.1. Employing engaging teaching strategies

Students in the hospitality education often struggle with mathematical concepts, but engaging teaching strategies like real-life examples can improve their understanding and enthusiasm. Chavez and Lamorinas[30] believed that assessment practices and strategies should protect the quality and integrity in the delivery of teaching and learning among higher education students. According to Hinojosa[31], professional development and training sessions can either introduce new instructional approaches or improve existing ones, such as integrating technology, differentiated instruction techniques, or culturally responsive methods.

Behavior can be influenced by experiential learning, in which students actively participate in real-world scenarios. In a restaurant management class, for instance, role-playing customer service encounters can highlight the value of effective communication and problem-solving abilities. Case studies that illustrate moral conundrums in the field can stimulate critical thought and mold moral decision-making practices. All things considered, good teaching techniques have the power to shape and alter behavior in the hospitality sector.

### 9.3.2. Interactive activities

Students' confidence and willingness to interact with the material increased because of interactive activities such as group discussions and hospitality scenarios, which improved their understanding of mathematical concepts. A large number of students' unfavorable attitudes and failures in mathematics can be attributed to the approaches and strategies employed by their teachers[32]. Since creating rich learning environments is crucial to increasing students' interest in and knowledge of mathematics, technological integration into mathematics learning settings is unavoidable. To improve student results and bring about significant behavioral changes, educators can cultivate a supportive learning environment and implement effective teaching strategies.

### 9.3.3. Implementation of innovative teaching method

There was a lack of interest in mathematics, but they realized the relevance and applicability of mathematical principles through creative teaching techniques including language-based problem-solving exercises. Since behavior is frequently profoundly established, teaching tactics can have an impact on behavior. Yang[33] found out that learners' internal motivation and learning outcomes can be used to assess creativity. Students can be motivated to engage more fully with the material and improve their language skills through positive reinforcement in language learning, which includes giving praise and rewards for desired behaviors.

Teachers that use creative teaching strategies can motivate their students to learn more. Role-playing games and language immersion programs are examples of interactive and immersive learning strategies that can motivate students to practice their language skills in authentic situations and result in long-lasting behavioral changes. Meaningful learning outcomes can be facilitated, and behavior can be effectively shaped by customizing teaching tactics to each student's requirements and learning style. Active learning strategies, such problem-solving exercises and group discussions, promote student involvement and engagement while developing critical thinking abilities, teamwork, and a deeper comprehension of the material. In general, instructional techniques have the power to shape behavior and affect how people learn.

**9.4.** Question 4. What non-traditional teaching strategies that can be linked to positive behavioral shift in learning mathematics?

### 9.4.1. Incorporation of real-life scenarios and examples

The usefulness of using mathematical ideas in the hospitality sector, which fits with their interests as professionals. They discovered that making math more accessible and interesting for students who are not math enthusiasts can be achieved by introducing real-life situations and examples from the field. Concrete exercises, group discussions, and visual aids such as infographics or diagrams can help clarify and simplify abstract mathematical topics. A positive attitude toward mathematics can be fostered by promoting a collaborative, supportive learning environment where students feel free to ask questions and experiment with diverse approaches to problem-solving. In general, students' perception and appreciation of mathematics can be greatly impacted by modifying teaching strategies to link with their interests and experiences outside of the classroom. This approach, which is supported by Gibson[34], allows experts in the field to professionally analyze and discuss different viewpoints on a single teaching situation. It also fosters collegial analysis of problem situations and the sharing of solutions. Math classes that use storytelling and real-world examples can effectively engage students who are not math enthusiasts by helping them grasp the relevance and practical applications of mathematics in everyday life.

### 9.4.2. Integration of interactive activities

Their attitude toward mathematics improved because of interactive activities. This idea is consistent with the findings of Hifza[35]. Participating in hands-on activities led to a deeper understanding of mathematical concepts and a more positive attitude towards the subject. Students' perception and appreciation of mathematics can be greatly influenced by fostering a collaborative and supportive learning environment, adapting teaching strategies to their interests and experiences, and including interactive activities like games, group discussions, or hands-on projects. These results emphasize the value of interactive exercises in creating a supportive learning environment and improving students' mathematical comprehension.

**9.5.** Question 5. What aspects of behavior shift was prominent in non-traditional teaching strategies?

#### 9.5.1. Increased engagement

A significant increase in students' interest in mathematics when they are exposed to real-world situations pertaining to the hospitality sector. Similar to Loo et al.[36], they took an active part in conversations and investigated mathematical ideas in real-world situations. The challenges of this model are the required commitment of time and effort, the need to foster class participation, and the facilitation of active communication within the class. Students appeared more willing to participate actively, demonstrating increased confidence in expressing their thoughts and opinions. The use of various teaching strategies led to noticeable shifts in student behavior and perceptions, including increased engagement during class discussions and activities.

#### 9.5.2. Improved confidence

The non-traditional teaching strategies boosted self-assurance in their mathematics skills because of adopting unconventional teaching techniques. This idea is aligned with the findings of Akbari[37] that students' self-confidence affects their learning in areas of participation, goal-seeking, developing interest in lessons, and in decreasing students' anxiety. Students who feel comfortable with their instructors and classmates are more willing to tackle problems and share their opinions in class. In line with this, Ceneciro[38] noted that students' self-confidence grows their confidence and reduces their anxiety in using the English language, particularly during academic engagements. Communication skills improved, and teamwork and collaboration improved, fostering a more cooperative learning environment.

#### 9.5.3. Positive attitude shift

Students' attitudes toward mathematics have significantly changed, according to the report, and they now recognize the value of the subject and how it will affect their future employment. The use of instructional strategies improved students' problem-solving abilities and fostered critical qualities like teamwork, communication, and problem-solving abilities in hospitality students. Kabir[39] found out that positive people have longer lifespans, lower rates of depression, and lower stress levels. Additionally, students' critical thinking abilities increased, which made it easier for them to assess and comprehend complicated materials. Students showed a stronger sense of teamwork, which resulted in a higher desire to cooperate and encourage one another in their studies.

## 10. Conclusion

The need of getting non-math enthusiasts interested in understanding mathematical concepts is becoming increasingly apparent in the field of education. These people are frequently uninterested in and unresponsive to traditional teaching approaches, which results in disengagement and low academic achievements in mathematics. Nevertheless, a notable change in behavior was visible when non-traditional strategies with real-life math learning transactions were at place.

With the non-traditional teaching strategies, non-math enthusiasts are able to understand the significance and relevance of mathematical concepts in their daily lives when practical applications of math are integrated into typical real-life scenarios. In addition to making learning more fun, this practical method gives the students a better understanding of how math is applied in everyday life.

Non-math enthusiasts can start to regard themselves as competent problem solvers and develop confidence in their mathematical skills by adopting this change in behavior. Regardless of their initial

excitement for the topic, educators can assist all students in bridging the theory and practice divide by adopting cutting-edge teaching strategies that link mathematics to real-life events.

## Conflict of interest

The authors have no conflict of interest to declare.

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