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**RESEARCH ARTICLE**

# Instructional management strategies for addressing low student engagement in mathematics

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## ABSTRACT

Student engagement and interest are critical components of the learning process, as they directly influence students' academic success and motivation. When students are engaged, they are more likely to actively participate in lessons, invest time and effort into their studies, and demonstrate perseverance in the face of challenges. Interest sparks curiosity and a desire to explore subjects further, helping students to connect emotionally and intellectually with the material. This paper explored the instructional management strategies that college mathematics teachers employ to encourage students to learn mathematics in classrooms. College teachers (n=16) were purposively sampled to be interviewed in this study. Narratives were collected and analyzed to extract recurring themes within their experiences. Findings indicated that students often demonstrated low interest in mathematics due to non-academic and emotional challenges, such as financial stress and mental health issues, which hindered their ability to focus and engage in the subject. Students exhibited low interest in mathematics, demonstrated through non-verbal cues such as slouching, avoiding eye contact, and disengaging from class discussions or group work. Teachers observed that having a supportive classroom environment, promoting open communication, and using interactive learning strategies, such as real-world applications and case studies, helped improve student participation and engagement. Recognizing the impact of social and emotional factors on learning, such as anxiety and depression, reflected the importance of establishing trust and strong teacher-student relationships to provide both academic and emotional support, which develops students' motivation and self-confidence in mathematics. Nevertheless, addressing these challenges and incorporating active learning strategies could improve student engagement and learning outcomes in college mathematics.

***Keywords:*** active learning; instruction; mathematics; student engagement

## 1. Introduction

Student engagement is a fundamental aspect of the learning process. Active involvement is essential for effective learning, with action serving as the key indicator of learner engagement[1]. Engagement covers a broader scope, indicating both the quantity and quality of learners' active participation and involvement

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in learning tasks or activities. An engaged learner demonstrates active involvement and a strong commitment to their own educational process. In the absence of such engagement, the likelihood of achieving meaningful learning diminishes significantly[2,3]. The increasing recognition of the significance of student engagement within modern educational frameworks has rendered it a highly sought-after subject of inquiry, to the point where it has been characterized as 'the holy grail of learning'[4,5].

Student engagement serves as an essential aspect in the success of students within higher education, garnering significant focus over the past ten years from school administrators, professionals, and scholars[6,7]. It holds significant implications for perseverance, comprehensive learning, student satisfaction, and academic achievement[8,9]. This paper aimed to expand the discussion on student engagement by identifying potentially effective instructional strategies for managing disengaged behaviors in the classroom.

Several studies were conducted on student engagement in mathematics. In elementary education, Gustina[10] found that interest in learning significantly impacted math learning outcomes among fifth graders, with a regression coefficient indicating that 83% of the learning outcomes were explained by students' interest, while the remaining 17% was influenced by external factors. Similarly, students' interest in learning has significant influence on their mathematical literacy skills[11] and learning outcomes[12]. Meti et al.[13] found that students' mathematical literacy skills are directly influenced by their interest in learning mathematics: students with low interest tend to have lower mathematical literacy skills, while those with high interest tend to achieve higher levels of mathematical literacy.

Further, student engagement is affected by context-specific variations, including the learning environments and the strategies employed by teachers[7]. Consequently, the teacher must facilitate the enhancement of students' mathematics knowledge by providing opportunities that challenge and engage them in advanced cognitive processes, through a judicious selection of strategies and activities[14]. With active classroom learning process, teachers cater to various cognitive processes exhibited by students, involving them in demanding tasks, preferably with multiple solutions, emphasizing experiential activities that inspire them to learn mathematics and collaborate effectively[15]. Given the known factors behind students' disengagement in learning mathematics, like math anxiety[16], low motivation[17], and insufficient practical experience[18], there is a growing need for integration of teaching strategies in mathematics. This paper discussed several factors contributing to students' disengagement in learning mathematics and identified areas where teachers can provide support.

A mathematics class in the Philippines use a system of questions and answers, wherein the teachers begin with definitions and rules, while students remain predominantly silent and passively listen to the speaker[19]. Learning resources, both text-based and non-text-based, have been designed to meet the needs of students and relate to the curriculum, covering the competencies outlined in the curriculum guidelines[20]. However, only recently have teachers recognized how classroom instructional strategies can shape student engagement in learning mathematics. For example, Ignacio Jr[21] examined the educational beliefs of fourth-year Filipino preservice mathematics teachers using a qualitative-exploratory approach, revealing four main themes: the teacher as a knowledge dispenser, reliable improver, equity promoter, and strategic scaffolder. The study found a range from teacher-centered to student-centered beliefs, with knowledge dispensing being the most teacher-centered and strategic scaffolding the most student-centered. Consequently, understanding of instructional management strategies in the Philippines was far beyond established. This paper would like to fill this conceptual gap in the literature with emphasis on factors of disengagement in mathematics learning and how teachers could provide aid to their students. Such understanding would shape the education system in the country to lean towards student-centered learning.

Understanding the dynamics of teaching mathematics-related subjects to disinterested students is a critical area of research. Educators face various challenges, from students' lack of focus to resistance toward lessons, which can hinder academic progress and classroom engagement. This study explored the experiences of teachers in mathematics-related subjects and how they deal with students' behaviors, aiming to identify patterns and strategies to address disinterest. The succeeding section presents the Literature Review section which examines relevant studies on student disinterest, its underlying causes, and the strategies educators use to address this challenge. The Methodology section details the participant selection process, data collection methods, and analytical approaches employed in the study. The Results and Discussion section presents and analyzes the findings, focusing on common behaviors exhibited by disinterested students and the strategies participants used to manage them. Finally, the Conclusion and Recommendations section summarizes the key findings, discusses their implications for educational practice, and provides recommendations for future research.

## 2. Literature review

Students with difficulties in reading and mathematics experience many challenges during their education. Students tend to be underachievers as they have to compensate for poor reading/mathematical skills by working harder[22]. Objectively, learning difficulties can be characterized as an inability to meet established learning objectives, including a minimum level of mastery, not achieving appropriate milestones, struggling to fulfil developmental tasks, and lacking the necessary level of mastery required to progress to subsequent learning stages[23-25].

Mathematics embodies an abstract discipline that holds significant relevance for students, particularly in its application to daily life scenarios. Yet, a significant number of students have negative experiences and perceptions that hinder their ability to learn mathematics effectively[26,27]. Mathematics learning difficulties manifest as challenges faced by students in comprehending mathematical processes, as well as in executing tasks that involve data, figures, numbers or mathematical symbols[28,29]. The difficulties encountered in learning mathematics are associated with the articulation of concepts, the provision of examples and non-examples, the comprehension of concepts, the utilization of symbols, the process of calculation (counting), the application of concepts, and the interpretation of problems[30].

Difficulty in learning can be linked to different factors that cause students to be disengaged in learning. For example, Asanre, Ifamuyiwa and Abiodun[12] investigated the impact of behavioral, emotional, and cognitive engagement on mathematics achievement among senior secondary school students in Ogun State, Nigeria. Using a descriptive survey and data from 1680 students across 21 randomly selected schools, the research found that all three types of engagement—cognitive, behavioral, and emotional—significantly predict students' mathematics achievement. Students with low engagement in learning tend to perform and participate less in their classroom activities. Student engagement, a complex and multifaceted construct, is often defined as the investment and energy that students dedicate to learning[31-33]. As a multidimensional psycho-social process, it involves three interrelated dimensions: behavioral, emotional, and cognitive engagement[31,34]. Behavioral engagement refers to students' participation in course activities and adherence to established norms, while emotional engagement involves their emotional reactions to activities, peers, and the teacher, as well as their sense of belonging in the course. Cognitive engagement is characterized by students' psychological investment in mastering complex knowledge and their use of learning or metacognitive strategies[12]. Heilporn, Lakhal and Bélisle[7] summarize this engagement as going beyond mere attendance and academic performance, with engaged students demonstrating persistence, self-regulation, and a willingness to embrace challenges in learning. However, Adigun[35] identified several key

factors that may affect students' interest in the study of mathematics, including parental encouragement, peer influence from friends and classmates, as well as potential career prospects and job opportunities, among other considerations.

Consequently, there is a need to establish a positive classroom environment that encourages students to learn mathematics. For example, cognitive engagement in learners is characterized by their ability to demonstrate intentional, selective, and prolonged focus to accomplish specific tasks or learning objectives[36]. Similar form of engagement can be observed in several instructional strategies employed by teachers in classrooms. Johnson et al.[37] found that online games positively influenced student engagement and motivation, leading to enhanced academic performance. A systematic review conducted by Liu et al.[38] indicated that the use of educational software has the potential to enhance student engagement and academic performance in the field of mathematics education. Inoferio et al.,[39] investigated how artificial intelligence (AI) can assist students in overcoming math anxiety and boosting their confidence in mathematics learning. Their findings revealed that AI models serve as effective "mentors" and "math companions," providing personalized support and step-by-step explanations that make mathematics more accessible.

This paper was concerned about how to encourage students to learn mathematics considering their disengaged behaviors in learning. Teachers demonstrating effective teaching practices and establishing supportive learning environments are more likely to enhance student engagement in mathematics. Torrejos[40] conducted a study in a private Catholic higher educational institution in Davao City, Philippines regarding influence of perceived teaching performance and critical thinking skills on mathematics engagement of college students in Mathematics in the Modern World. Findings indicated that among the five domains of perceived teaching performance of college instructors (i.e., Organization and Responsibility, Instruction and Clarity, Interpersonal Relation, Assessments, Comprehensive Education) specializing in Mathematics in the Modern World, interpersonal relations received the highest mean score, indicating that students view their instructors as highly effective in this area. This exceptionally high rating reflects the instructors' approachability, engagement, and rapport with students, creating a supportive learning environment for blended learning in mathematics.

# 3. Objectives

Mathematics instruction in the country is long been teacher-centered, which delimits learning processes among students. Hence, this paper would like to expand the understanding of students' deprioritized learning interests, especially in the context of Philippine college education. This paper explored the experiences of college mathematics teachers about their students' deprioritized learning interest in the subject. This paper also gathered narrative data on how the teachers responded to students' disinterested learning behaviors. Below are the specific objectives established in this study.

1. Determine challenges of learners with low learning interests in mathematics.
2. Identify teachers' strategies to mitigate learners with low learning interests.

# 4. Methods

## 4.1. Research design

This paper explored different instructional management strategies to develop the interest of students in learning mathematics. Exploratory studies serve an essential purpose in research, especially in subjects that are either inadequately studied or undergoing rapid changes, like the emergence of GenAI in higher education. Such studies prioritize flexible, open-ended methods designed to capture preliminary insights

about a phenomenon without predefined hypotheses or strict variables, allowing researchers to discuss their subjects more objectively. This flexibility is essential for exploring new social, psychological, or technological phenomena, as it enables researchers to identify patterns, themes, and unique participant experiences that might otherwise go unnoticed[41-43]. Studies in exploratory research often rely on qualitative methods, such as interviews or open surveys, which provide rich contextual data to formulate an initial understanding[44-45]. These studies are not solely about documenting observations but also involve drawing connections that lay the groundwork for more structured, hypothesis-driven research. Swedberg[43] emphasized that exploratory research provides a guide or broad outline of a subject, which later research can expand upon through rigorous testing and validation. In social science, exploratory studies are conducted with carefully organized and systematic procedures, enabling the identification of key patterns and insights within complex social interactions[46-47]. Such rigor helps to address critiques about their scientific validity, as these studies often provide critical, initial insights into poorly understood domains. Although sometimes criticized for their perceived lack of rigor, these studies offer significant practical value by enabling researchers to collect preliminary data efficiently, which can inform more focused, detailed research efforts in the future[43]. This exploratory study on instructional management strategies exemplifies the value of exploration by addressing an inadequately studied area, capturing elaborate contexts about student engagement in mathematics, and building a framework for future research.

## 4.2. Participants and sampling

In exploratory research, sampling is often conducted with a focus on depth and detail rather than on broad representativeness, which is why sample sizes are typically small[48,49]. Hence, it was generally reasonable for this study to have only 16 participants, specifically math-oriented college teachers. Small sample sizes allow researchers to investigate details of participants' experiences and perspectives within a specific group, facilitating an in-depth understanding of variables and interactions[42,50]. Qualitative designs commonly used in exploratory studies—such as phenomenology, case studies, and narrative inquiry—rely on purposeful, non-random sampling to enhance data richness and relevance[51,52]. College teachers were selected by online purposive sampling[53] which gathered preliminary data about teachers' experiences. Out of 76 who responded, only 16 college teachers were selected based on three main characteristics: (1) teaching experience (minimum of three years), (2) teaches math-related subjects (like statistics, calculus, algebra, economics), and (3) educational background (at least a master's degree holder). Participants were cross-examined through the records of the administrative office, which maintains detailed faculty profiles. This record-based sampling method facilitated access to faculty members meeting the specific criteria and helped in ensuring a sample of educators with well-documented qualifications and relevant teaching assignments. Through this process, researchers can gather information directly related to the study purpose, which enriches the contextual relevance of the narrative data[54,55]. The flexibility of purposive sampling is thus integral to exploratory research, as it allows researchers to continually refine participant criteria, capturing relevant data even as new themes or questions arise[56]. Consequently, purposive sampling facilitates the collection of rich, detailed data, offering a foundation for generating hypotheses and guiding future research in developing areas[43, 44]. **Table 1** presents the summary of sampled participants' information, including their sex, age, teaching experience, subjects taught, educational background, and how students show learning disinterest.

**Table 1**. Summary information of sampled college teachers.

| Name | Sex | Age | Teaching Experience | Subjects Taught | Educational Background | Students' Disinterest |
|---|---|---|---|---|---|---|
| Anna | Female | 28 | 5 years | Algebra, | Master's in | Students often distracted—they do |

| Name | Sex | Age | Teaching Experience | Subjects Taught | Educational Background | Students' Disinterest |
|---|---|---|---|---|---|---|
| | | | | Statistics | Mathematics | unrelated activities such as doodling, daydreaming, or checking their phones. |
| Brian | Male | 32 | 8 years | Calculus, Economics | Master's in Economics | Students question relevance—they wonder why the material is important or how it relates to their lives or future goals. |
| Carla | Female | 29 | 4 years | Algebra, Calculus | Master's in Education | Students lack focus—easily sidetracked, they struggle to concentrate on the task at hand. |
| Daniel | Male | 35 | 10 years | Statistics, Algebra | Master's in Applied Math | Students hesitant to participate—they may provide one-word answers, avoid eye contact, or remain silent when asked a question. |
| Elaine | Female | 31 | 7 years | Statistics, Economics | Master's in Statistics | Students unmotivated—display little enthusiasm or interest in the lesson or tasks. |
| Francis | Male | 27 | 3 years | Calculus, Algebra | Master's in Mathematics | Students avoid challenges—prefer simple tasks, shy away from activities where they may face difficulties. |
| Grace | Female | 34 | 9 years | Algebra, Statistics | Master's in Education | Students shy to ask—reluctant to raise questions due to fear of judgment or not wanting to appear uninformed. |
| Harry | Male | 30 | 6 years | Economics, Statistics | Master's in Economics | Students uninterested—they show no enthusiasm for the subject matter or the class activities. |
| Irene | Female | 33 | 8 years | Calculus, Algebra | Master's in Math Education | Students intimidated—they feel overwhelmed by complex topics or challenges. |
| Jack | Male | 28 | 5 years | Statistics, Algebra | Master's in Applied Statistics | Students restless—often shifting their attention, tapping fingers, or looking around the room. |
| Karen | Female | 30 | 6 years | Economics, Algebra | Master's in Economics | Students resist effort—they may complain that lessons are hard or too demanding. |
| Louis | Male | 36 | 12 years | Calculus, Statistics | Master's in Mathematics | Students impatient—quickly lose interest if they don't understand a concept immediately. |
| Mia | Female | 29 | 4 years | Algebra, Economics | Master's in Business Education | Students lack curiosity—they do not seek out additional information or engage deeply with the content. |
| Nathan | Male | 31 | 7 years | Calculus, Statistics | Master's in Mathematics | Students overly dependent—rely heavily on the teacher for guidance and support. |
| Olivia | Female | 34 | 10 years | Algebra, Calculus | Master's in Math Education | Students resistant to change—unwilling to try new methods or adapt to different learning approaches. |
| Peter | Male | 37 | 13 years | Statistics, Economics | Master's in Applied Statistics | Students often distracted—they do unrelated activities such as doodling, daydreaming, or checking their phones. |

**Table 1.** (*Continued*)

## 4.3. Research instrument

An interview guide was designed to gather the responses of participants in the interview process. Exploratory studies often employ semi-structured interviews over structured questionnaires due to the flexibility required for deep exploration of participant perspectives and emerging themes[57,58]. Semi-structured interviews provide the interviewer with the freedom to probe into participant responses, offering an opportunity to explore participants' beliefs and ideas in more depth[59]. This flexibility is essential in qualitative research, where interviews are designed to follow a loose structure while allowing the researcher to address unexpected themes as they arise[60,61].

The development of a semi-structured interview guide is a multistep process that typically begins with identifying the study's goals and incorporating relevant background knowledge to frame the guide's questions[60]. Researchers construct an initial set of questions aimed at eliciting narrative responses, ensuring that the guide encourages participants to share detailed insights[59,62]. This preliminary guide is then subjected to pilot testing, which serves to refine the questions based on participant feedback, ensuring clarity and relevance[63,64]. The iterative process allows for adjustments based on participant understanding and engagement, improving the overall effectiveness and usability of the guide[60,61]. After testing, the final interview guide (**Table 1**) was expected to elicit the responses from the participants through thematic markers and coded ideas.

**Table 2.** Final guide questions for interview process.

| Objectives | Interview Questions |
|---|---|
| Determine challenges of learners with deprioritized learning interests | a. How do you identify students who might be struggling with motivation and engagement in your classroom? Enumerate and explain how.<br>b. What are the common reasons you think students might deprioritize their learning? Explain each reason.<br>c. What are the biggest challenges you face when working with students who have deprioritized learning interest? Explain each challenge. |
| Identify Strategies to mitigate learners with deprioritized learning interests | a. How do you tailor your instruction increase the interests of students who are not intrinsically motivated to learn? Elaborate further.<br>b. What are your strategies for building relationships and trust with students who are disengaged or resistant? Enumerate and elaborate each.<br>c. How do you incorporate real-world applications and connections to help students see the relevance of what they are learning? Suggest how. |

## 4.4. Data gathering procedure

One-on-one interview was the primary data gathering process carried out in this study. Narrative data were gathered from the participants which represents their experiences and perceptions of the subject matter. To conduct effective one-on-one interviews, researchers should establish a structured yet flexible approach to gather in-depth narrative data while actively listening to participants' experiences. In this study, this process begins with defining clear research objectives and selecting participants who meet specific study criteria, ensuring that the sample is representative of the phenomena under investigation[65,66]. Before starting the interview, the interviewers discussed the study's purpose, confidentiality, and data use with participants, creating a transparent and trustworthy environment[67]. By clearly communicating these points, the researcher establisheed direction, helping participants feel comfortable and more willing to share openly[62,68]. The interview process itself should feel conversational, as a more informal tone facilitates a natural flow of information and encourages participants to provide rich, narrative responses[69,70]. Despite this informality, it is essential to follow a well-organized interview guide that includes thematic questions aligned with the study's goals[71]. These thematic questions (as shown in **Table 1**) help direct the conversation toward core

topics, while follow-up probes allow the interviewer to discuss more about participants' responses, clarifying meanings and adding depth to the data collected[72,59].

### 4.5. Data analysis

Narrative data from interviews are analyzed to determine the recurring patterns using reflexive thematic analysis. Conducting thematic analysis involves a structured yet flexible approach to identify, organize, and interpret patterns of meaning within qualitative data, such as interview narratives. This method is widely used in exploratory studies where understanding participants' experiences, opinions, and behaviors is fundamental[73,74], as it allows researchers to uncover underlying themes related to participants' perspectives by coding data in a way that gradually progresses from descriptive to interpretative levels[75,76].

A reflexive thematic analysis approach, particularly useful for exploring participants' subjective experiences, emphasizes the researcher's active role in shaping the interpretation of data. Unlike approaches that strive for strict objectivity, reflexive thematic analysis acknowledges the researcher's influence as part of the analytical process, aligning the findings closely with the context of the study[77,78]. By adopting an inductive approach, where codes and themes are derived directly from the data, researchers can minimize preconceptions and focus on meanings that genuinely reflect participants' experiences[73]. This bottom-up approach supports the discovery of themes that resonate with the raw data itself rather than imposing preconceived ideas, making it particularly suitable for exploratory research[79,80]. The coding process for reflexive thematic analysis, as outlined by Braun and Clarke[81], typically involves six iterative phases (**Figure 1**): familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. These phases enable researchers to engage deeply with the data, ensuring that themes evolve naturally through repeated interaction and revision[73].

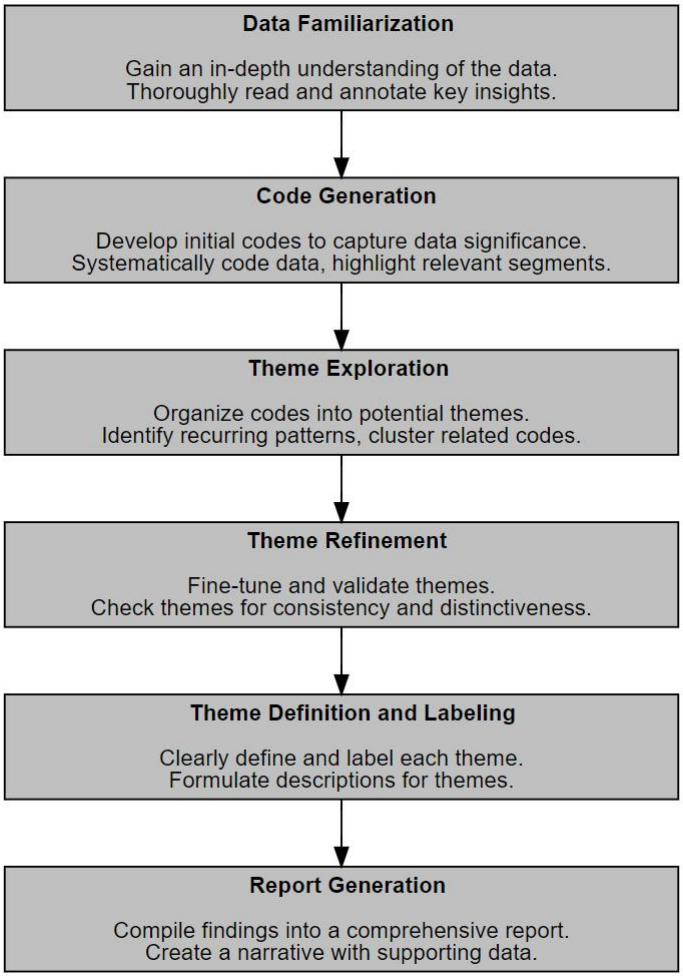


**Figure 1.** Six phases of reflexive thematic analysis.

# 5. Results

Objective 1: Determine challenges of learners with deprioritized learning interests.

Students' challenges related to deprioritized academic interests in mathematics highlighted three central themes: demotivation, non-academic problems, and emotional problems. Under demotivation, indicators such as a lack of participation, slouching body language, and missed classes frequently suggested a diminishing interest in academics. Educators noticed that late submissions or absence without reason often stem from deeper motivational issues. Non-academic problems emerged as another significant theme, with many students balancing family responsibilities, health issues, and financial stressors that detract from academic engagement. Financial concerns like tuition debt and living expenses further impede students' ability to prioritize their studies. Finally, emotional problems also reflect students' academic struggles, with issues such as anxiety, depression, and personal conflicts causing many to withdraw from coursework and group interactions, as they focus more on coping with emotional stress than on academic performance.

Theme 1: Demotivation

Demotivation revealed distinct patterns of behavior signaling disengagement among students. Learners who rarely spoke up or seemed disengaged often exhibited physical indicators of low motivation, such as slouching body language, lack of eye contact, and distracted behavior. These signs suggested that students struggled to connect with academic tasks.

> "Those who rarely speak up or seem disengaged often signal a lack of motivation. I also notice body language slouching, lack of eye contact, or distracted behavior can be telling signs."

Conversely, frequent late submissions or failure to submit assignments highlighted an underlying lack of commitment or interest in coursework. Regularly missing classes without valid reasons further reflected demotivation, suggesting that these students had diminished motivation or perhaps encountered barriers to staying engaged.

Generally, these patterns highlighted that demotivation was often expressed through both verbal and nonverbal behaviors, which cumulatively pointed to a broader disengagement from academic responsibilities.

> "Students who frequently submit late work or fail to turn in assignments altogether might be struggling with motivation."

> "Students who miss classes frequently, especially without a valid reason, are often struggling with motivation."

Theme 2: Non-academic Problems

Non-academic Problems identified significant factors outside the academic domain that impacted students' motivation and engagement. Students frequently experienced personal challenges such as family responsibilities and health issues, which often took precedence over academic obligations and led to a decrease in motivation and engagement.

> "Many students face personal challenges, such as family responsibilities or health issues. These can take precedence over academics, leading to decreased motivation and engagement in their studies."

Financial burdens emerged as another critical factor, as concerns about tuition, student loans, and living expenses weighed heavily on students, creating a persistent source of distraction. This financial anxiety, particularly the worry over accumulating debt from tuition and fees, hindered their focus on academic goals, making it difficult for them to maintain concentration and enthusiasm for their studies. These non-academic pressures diverted students' attention away from learning, further contributing to disengagement from their educational pursuits.

> "Financial concerns can distract students from their studies. Worrying about tuition, student loans, or living expenses can take a toll on their motivation to engage with coursework."

> "Many students are worried about accumulating debt from tuition and fees. This financial anxiety can overshadow their academic pursuits, making it hard for them to concentrate on learning."

Theme 3: Emotional Problems

Emotional Problems revealed how students' emotional and mental health challenges impeded their academic engagement and performance. For many, mental health issues such as anxiety and depression posed severe obstacles to their ability to focus on studies, creating a sense of emotional burden that made academic tasks seem overwhelming. Students struggling emotionally often found learning to be a secondary priority, as their immediate need was to manage their mental well-being.

> "Mental health issues like anxiety or depression can severely impact a student's ability to focus on their studies."

> "When they're struggling emotionally, learning can feel overwhelming and less important than addressing their mental well-being."

Moreover, students experiencing anxiety were inclined to participate less in discussions or group work, signaling a withdrawal from academic interactions. The impact of personal relationships was also significant; conflicts with friends or family issues introduced further emotional stresses that detracted from students' capacity to engage with their studies, resulting in a noticeable decrease in motivation.

> "Students who struggle with anxiety may participate less in discussions or group work."

> "Personal relationships can impact students profoundly. Whether it's conflicts with friends or family issues, these emotional stresses can distract them from their studies and lead to decreased motivation."

These emotional challenges collectively contributed to a diminished academic experience, as students grappled with internal obstacles that frequently overshadowed their educational objectives.

Objective 2: Identify strategies to mitigate learners with deprioritized learning interests.

This study highlighted three key instructional management strategies—Communication, Interactive Discussions, and Learning Applications—in addressing strategies to support students with deprioritized learning interests. Communication emphasized the importance of individualized outreach, as instructors frequently followed up with students through various channels to understand and respond to their needs. Strategies such as private follow-ups and an open-door policy were instrumental in building trust, enabling students to feel more comfortable seeking support. Interactive Discussions focused on creating inclusive classroom environments where students felt safe and valued. Techniques such as inclusive discussions, highlighting diverse perspectives, and utilizing collaborative online platforms encouraged reluctant students to engage actively, whether in physical or virtual settings. Learning Applications demonstrated how connecting course content to real-world applications and industry case studies made the material more accessible and relevant.

Theme 1: Communication

College teachers found that maintaining consistent and individualized outreach was essential for re-engaging students who had deprioritized their academic interests. Teachers observed that these students often avoided communication, making it challenging to gauge their needs and difficulties. This tendency to remain silent or be unresponsive to emails or in-class discussions signaled a need for more proactive measures.

> "Students who deprioritize learning often avoid communication. It can be hard to understand their needs or challenges when they're not responsive to emails or in-class discussions."

> "If certain students consistently remain silent, it raises a flag. I sometimes follow up with them privately to encourage them to share their thoughts in a supportive environment."

As a result, teachers chose to follow up individually with these students, whether to understand their situations or to see if they required specific assistance. By doing so, teachers aimed to create a more supportive and understanding environment. Additionally, they discussed how following up with absent students helped communicate the academic impact of missed classes, motivating these learners to re-engage while offering them resources to catch up.

> "I try to follow up with them individually to understand their situation."
>
> "I reach out to them to see if there's anything they need."
>
> "I follow up with absent students to discuss how missing class affects their learning and to encourage them to come back, offering resources to help them catch up."

To further promote a sense of safety and accessibility, some educators established an open-door policy, actively inviting students to share their concerns whenever they felt comfortable. This approach was meant to build trust and break down the barriers to communication that might prevent students from seeking help.

> "I establish an open-door policy, encouraging students to approach me with their concerns at any time. This openness builds trust and makes it easier for students to seek help."

Theme 2: Interactive Discussions

In teaching college mathematics, teachers highlighted the importance of developing an inclusive and low-pressure environment to encourage participation from students who may otherwise disengage. They noted that by creating a classroom atmosphere where students felt safe and included, they were able to promote participation from reluctant students. Establishing ground rules for respectful discussion and celebrating diverse perspectives helped make the classroom a space where all voices were heard, which made students more comfortable in sharing their unique perspectives during discussions.

> "I've found that creating a more inclusive and low-pressure environment encourages those students to engage more."
>
> "I strive to create a classroom atmosphere where all students feel safe and included. I establish ground rules for respectful discussion and celebrate diverse perspectives, making it easier for reluctant students to participate."
>
> "I actively encourage students to share their ideas during discussions. I often highlight the value of different viewpoints, which helps create an environment where all voices are heard."

Teachers also took steps to deepen their engagement by involving students in active roles, such as assigning them to present case studies and lead discussions. This practice not only enhanced students' understanding of the material but also gradually built their confidence and communication skills.

> "I assign students to present case studies, allowing them to lead discussions. This not only reinforces their understanding but also slowly builds confidence and communication skills."

The integration of technology through virtual simulations and online collaborative platforms allowed educators to showcase real-world applications of course concepts, making the learning process more engaging and accessible.

> "I leverage technology, such as virtual simulations or online collaborative platforms, to demonstrate real-world applications of course concepts. This makes learning more engaging and accessible."

To extend discussion beyond the classroom, some educators established online discussion boards, enabling students to engage with the content at their own pace and encouraging collaboration outside of class.

> "I set up online discussion boards where students can post their thoughts and questions about the material. This allows them to engage with the content at their own pace and encourages collaboration outside of class."

These strategies collectively reinforced a learning environment where students could engage actively, build confidence, and see the practical relevance of their studies.

Theme 3: Learning Applications

Teachers emphasized their efforts to connect course material to real-world applications to enhance student engagement. They actively incorporated current events and industry trends into discussions, which helped students see the relevance of what they were learning. This approach aimed to spark students' interest by illustrating how academic concepts intersect with real-world scenarios.

> "I make an effort to connect course material to real-world applications. By discussing current events or industry trends, I help students see the relevance of what they're learning, which can spark their interest."

In teaching college mathematics, teachers frequently integrated relevant case studies as part of their teaching strategy. By analyzing real businesses or situations, they provided students with opportunities to apply theoretical concepts, making the material more relatable and engaging. Using case studies from industry leaders served to further reinforce this connection, demonstrating how theoretical concepts were applied in practice. This approach highlighted the direct impact of students' learning on tangible, real-world problems, fostering a sense of practical purpose and relevance in their academic pursuits.

> "I frequently use case studies relevant to the subject matter. Analyzing real businesses or situations helps students apply theoretical concepts, making the material more relatable and engaging."

> "I use case studies from industry leaders to analyze how theoretical concepts are applied in practice. This approach helps students see the direct impact of their learning on real-world problems."

# 6. Discussion

The interest to engage in learning activities stems from an intrinsic desire to enhance one's knowledge, skills, and experiences[82]. A student's interest in learning serves as a critical determinant that impacts the overall effectiveness of the educational process. Individuals exhibiting a pronounced interest in the learning process often demonstrate increased levels of activity, enthusiasm, and a robust intrinsic motivation to engage with educational material[83]. Several investigations have been conducted in the field of mathematics, particularly focusing on educators' perceptions regarding the influence of social variables on the teaching and learning processes of mathematics, as well as the relationship between motivation and achievement of students in mathematics[84-86]. This paper aimed to understand the factors contributing to college students' low learning interest in mathematics and to explore how teachers respond to these challenges.

Students demonstrated low interest in learning through body language cues, such as slouching, avoiding eye contact, displaying distracted behavior, and a reluctance to communicate. Based on teachers' experiences, they observed their students being demotivated in learning mathematics, probably because of non-academic and emotional problems. For example, one teacher revealed that "Worrying about tuition, student loans, or living expenses can take a toll on their motivation to engage with coursework." Financial stress was often seen as a barrier, as students preoccupied with financial concerns found it difficult to focus on their studies.

Moran et al.[87] highlighted the significant financial challenges faced by Australian midwifery students, driven by rising costs of living and unpaid clinical placements, which hinder their ability to complete their programs. Similarly, Malaysian college students experienced financial difficulties due to constrained financial resources and encountered increased living expenses[88]. In this instance, college students in this study displayed disinterest in learning mathematics causing them to participate less in discussions or group work. Some teachers also noted their students submit late work or fail to turn in assignments because of how disinterested they are in learning the subject. This has a direct impact on their academic performance as financial problems force students to drop the subject[89].

Further, college teachers also recognized the anxiety that their students experience not on the subject but within social setting. Teachers said that "…anxiety or depression can severely impact a student's ability to focus on their studies," which "…can feel overwhelming and less important." There is a surge on mental health issues among college students[90,39,91], and this also has impact to their learning interest and academic performance[92]. Abinaya and Vadivu[93] discovered that social phobia among students includes a fear of criticism, with increased social anxiety leading individuals to avoid situations where they might be judged. This avoidance can hinder the ability to build relationships, perform well in school or work, and lead a fulfilling life. It was common for students to experience anxiety when learning mathematics, as they feel concerned about how they share their ideas and communicate with others[39]. In this paper, a teachers observed that "Students who struggle with anxiety may participate less in discussions or group work." college teachers have expressed a deep awareness of the social and emotional challenges their students face, recognizing that anxiety in particular affects more than just academic performance—it also influences how students interact within the classroom. They observed that students often experience anxiety or depression not necessarily due to academic content itself but because of the pressures of a social environment that demands active participation and peer interaction.

Reflecting from the instances where college students demonstrated deprioritized learning interest in mathematics, teachers realized their role in managing classrooms that enable their students to be engaged in learning. This paper noted three major strategies to manage disinterested students, particularly through communication, interactive discussions, and learning applications.

Teachers believed that in solving problems "openness builds trust and makes it easier for students to seek help." This strategy can be applicable to problems beyond the control of teachers, like financial concerns and mental health problems. Fundamentally, Sotardi[94] argued that when confronted with a personal challenge, the choice to seek assistance necessitates evaluating multiple elements, including one's emotional condition and apprehensions regarding public perceptions, in relation to the availability and efficacy of support options. In classrooms where openness is normalized, students may feel more empowered to discuss not only academic challenges but also underlying issues such as financial strain or mental health concerns, which can profoundly impact their academic engagement. When trust is present, teachers can provide guidance and refer students to appropriate resources, which supports a more holistic approach to learning that addresses both cognitive and emotional well-being[95].

Establishing a favorable teacher-student relationship is essential for enhancing learning, as it motivates students to continue their studies and establishes a supportive atmosphere conducive to inquiry and discussion[96]. In classroom discussions, it is important to "strive to create a classroom atmosphere where all students feel safe and included." Vale and Barbosa[97] promoted teaching practices that necessitate cognitive involvement in the creation of new knowledge, particularly emphasizing the significance of problem-solving in mathematics. Active learning originates from socio-constructivist learning theory and manifests in

classroom practices that involve students in activities such as speaking, listening, reading, writing, discussing, reflecting, hypothesizing, and debating content with problem-solving in small groups, including experimentation and other tasks[98-100]. These scenarios necessitate students to utilize their acquired knowledge, engaging in higher-order cognitive skills[101,102]. Such mechanism can be found in interactive discussions through case studies and real-life learning applications. For example, teachers used case studies to enable students to be familiar with the applications of mathematics in the real-world. Teachers use real-world data from businesses to teach students the applications of mathematics in their future careers, which in turn, shows improvements to their class engagements. For teachers, this learning opportunity "…not only reinforces their understanding but also slowly builds confidence and communication skills" as it makes the discussion relatable and engaging for students. In active learning, teachers encourage students to articulate a phenomenon in their own terms while employing the formal knowledge acquired during lectures may compel them to deduce, synthesize, understand the subject, and justify their responses[13].

The findings could have pedagogical implications for improving college students' interest and engagement in learning mathematics. Teachers must recognize and address non-academic factors, such as financial stress[104] and mental health challenges[105], which can significantly impact students' motivation and focus, as financial concerns may lead students to low interest in their studies or avoid participation, while anxiety in social settings can limit their classroom engagement, preventing them from fully benefiting from the learning experience. Teachers' awareness of these factors can inform their approach to building a supportive and open environment that encourages students to seek help and encourage both academic and emotional support networks. Consequently, establishing strong teacher-student relationships and openness can build the trust necessary for students to feel comfortable discussing personal challenges that may hinder their academic performance[106,107].

Strategies promoting transparency and support within the classroom, such as active listening and providing real-world learning applications, may enhance student engagement and make mathematics more relatable and approachable. Integrating active learning strategies—like case studies and small-group discussions—can encourage students to apply their knowledge and improve both cognitive and social skills, compelling them to engage more deeply by analyzing, discussing, and synthesizing information, which helps them build confidence and communication skills essential for academic and future career success[108]. Nevertheless, implementing structured support systems and incorporating these holistic strategies across educational institutions may not only improve interest and engagement in mathematics but also address broader issues of well-being.

# 7. Conclusion

This study explored how academic and non-academic factors shape college students' interest and engagement in learning mathematics. For teachers, they observed that students often exhibited low interest in mathematics due to various challenges, particularly financial stress and mental health issues, which adversely affected their motivation and classroom participation. Teachers' insights highlighted the necessity of recognizing these barriers and implementing strategies to build a supportive learning environment. Having strong teacher-student relationships and promoting open communication, educators created a classroom atmosphere that encouraged students to address their challenges, which teachers believed enhanced students' academic engagement.

The paper suggested that educators should adopt a holistic approach to teaching mathematics, which incorporates awareness of students' socio-emotional needs alongside academic content. Strategies such as active learning, real-world applications, and interactive discussions can bridge the gap between students'

experiences and mathematical concepts, making the subject more relatable. Conversely, with transparency and support in the classroom, teachers can help mitigate the negative impacts of financial and mental health challenges, while encouraging a culture of trust and open dialogue. As a result, educational institutions may see improvements in students' academic performance, motivation, and overall well-being that creates an engaging and inclusive learning environment.

It is imperative to reflect on the limitations emerged in this paper. The sample size may not fully represent the experiences of all college teachers, potentially limiting the generalizability of the findings. The study primarily relies on teachers' perceptions, which, while important, may not capture the full spectrum of students' experiences and feelings toward mathematics. The focus on non-academic factors may overlook other potential influences on student engagement, such as pedagogical methods or curriculum design. Future research could benefit from providing varying perspectives, including direct input from students, to develop an in-depth understanding of the factors influencing interest and engagement in college mathematics.

## Conflict of interest

The authors declare no conflict of interest.

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