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Factors Influencing Senior High School Students' Aversion to Physics

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ABSTRACT

This study examined the factors influencing senior high school students' aversion to physics in Marawi City, Lanao del Sur, Philippines, during the 2023–2024 academic year. Using a descriptive survey design, data were collected from 212 STEM strand students in two public schools through the validated Physics Aversion Survey Instrument. Results showed that fear of mathematics was the most significant factor, particularly difficulties in mathematical manipulation, computation, and memorization of formulas. The nature of physics (its complex concepts, principles, and problem-solving demands) also contributed to aversion, while hands-on experiments were not deterrents. Teacher-related factors, such as lecture-based methods and frequent problem-solving assignments, moderately influenced attitudes, whereas student interest played a lesser role. The overall aversion level was high, with fear of mathematics rated "very high." Findings highlight the need to reduce math anxiety, simplify problem-solving, and adopt interactive, student-centered approaches to foster engagement, improve achievement, and support inclusive physics education.

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1. INTRODUCTION

Developing an understanding and appreciation for physics among students remains a significant challenge in the education system. Studies have consistently shown that many students, particularly at the secondary level, perceive physics as difficult (Guido & Dela Cruz, 2015), which might be a source of aversion to the subject. Aversion is defined as a feeling of strong dislike or unwillingness to do something (https://dictionary.cambridge.org/dictionary/english/aversion). In the context of this study, aversion to physics refers to the phenomenon characterized by a negative attitude towards the subject, leading to fear, anxiety, and avoidance of physics-related tasks and learning opportunities.

Surprisingly, aversion was found to be associated with anxiety (Dong et al., 2022). If aversion among students is not addressed, they may end up failing in the subject, and the worst is dropping out of school. In addition, physics will continue to have a negative reputation among students, making it an unattractive course choice for college enrollment, which could lead to a shortage of physicists and physics teachers in the long run (Abraham & Barker, 2014).

The aversion to studying physics is not confined to any single country but has become a widespread global issue, with students around the world increasingly turning away from the subject. In Australia, for example, the proportion of high school graduates pursuing physics has declined significantly over the years. Data from the New South Wales Australian Tertiary Admissions reveals that the number of students enrolling in physics at the college level dropped from 24% in 1991 to 17% in 2014. A similar trend is evident in the United States, where enrollment in high school physics lags behind other science subjects (Chang et al., 2018). In 2023, only 8,295 students earned bachelor's degrees in physics, marking the third consecutive year of decline after two decades of steady growth. This represents a 3.7% decrease from the previous year and nearly an 11% drop from the peak of 9,296 degrees awarded in 2020. Moreover, a five-year survey by the American Institute of Physics found that approximately two-thirds of U.S. college students who initially expressed interest in physics ultimately switch to other programs.

These declining trends are not isolated to the U.S. and Australia but are observed globally, highlighting a broader concern for the future of physics education. In Germany, for example, dropout rates in introductory physics courses range from 25% to 30%, with the highest rates seen in teacher education programs. Similarly, in the Philippines, the State University of Northern Philippines has reported rising dropout rates in its physics degree program, with 2.67% leaving in the 2021-2022 school year and 2.33% in 2022-2023 (Bravo, 2023). If these concerning trends in enrollment, graduation rates, and increasing dropout rates continue, the field of physics could face a significant shortage of qualified professionals, especially in physics education at both the secondary and tertiary levels. Addressing these issues is critical to ensuring a stable future for the discipline.

Studies consistently reported that the decline in physics enrollment, as well as the deteriorating performance in physics, is driven by students' aversion to physics. This phenomenon could be associated with students' encountered difficulty in physics. Many studies point to students' perception of physics as difficult to study, originating from the nature of physics as a discipline (Adianto & Rusli, 2021; Astalini *et al*., 2019; Sarabi & Abdul Gafoor, 2018; Bello et al., 2018; Ekici, 2016; Erinosho, 2013). On the other hand, the way the teacher facilitates the physics classroom plays an important role in students' aversion to the subject. Most physics students complained that their physics teachers are not linking what they teach to daily life experiences. During classroom sessions, most of these teachers do not often respond appropriately to students' wrong answers and misconceptions (Maxwell & Rose, 2022), which leads to students' disengagement. Students' interest in physics could also be associated with students' aversion to physics. Accordingly, students' interest in learning physics was related to motivation for learning physics and a considerable predictive strength of interest on students' self-efficacy and self-determination in learning physics (Kwarikunda et al., 2020). They also emphasized that some of the reasons why student liked or disliked the physics subjects were closely related to their success in solving some standard physics problems usually found at the end of the chapters of every physics book, their past learning experiences, and the difficulty level of some physics subjects. Other factors that may contribute to students' aversion to physics include fear of mathematics (Laguindab et al., 2025; Foley et al., 2017), poor mathematical skills (Adianto & Rusli, 2021; Kapucu, 2017; Reddy & Panacharoensawad, 2017), gender, and negative learning experiences and outcome expectations.

Given the global trends in physics aversion, it is crucial to explore whether similar challenges are faced by Senior High School students in the STEM track in Marawi City, Lanao del Sur, a region with its own unique socio-cultural and economic context. While the decline in physics enrollment and performance has been well-documented worldwide, there is limited research on the specific factors influencing Senior High School STEM students' attitudes toward physics in the Philippines, particularly in areas like Marawi City. The challenges faced by students in this region, such as the effects of conflict, limited resources, and cultural factors, may significantly shape their perceptions and engagement with STEM subjects, including physics. By focusing on Senior High School students in the STEM track, this study seeks to fill this gap in local research and gain a deeper understanding of the specific factors contributing to their aversion to physics. Identifying these challenges will not only help inform targeted strategies to improve teaching methods and student engagement, but it will also guide efforts to foster greater success and interest in the subject.

By exploring and understanding the causes of students' aversion to physics, this study aims to address these challenges more effectively. The findings could provide valuable insights into the unique difficulties faced by STEM students in Marawi City, which can inform the development of tailored interventions and pedagogical strategies. These strategies would focus on enhancing student engagement and improving achievement in the subject. Furthermore, the study's outcomes will contribute to a broader understanding of the factors shaping STEM education in diverse cultural and socioeconomic contexts. This can, in turn, help inform policy and curricular decisions aimed at promoting inclusive and equitable STEM learning opportunities for all students.

The purpose of this study was to investigate the students' aversion to physics. Specifically, the study aimed the following: (i) assess the major causes of students' aversion to physics; (ii) assess the level of students' aversion to physics.

2. THEORITICAL FRAMEWORK

This study is grounded in three key educational theories. Cognitive Load Theory (Sweller, 1988) suggests that the complexity of physics problems and the need to memorize formulas can overwhelm students' cognitive resources, leading to aversion. Mathematics Anxiety Theory (Richardson & Suinn, 1972) highlights how students' fear of mathematics can hinder their ability to succeed in physics, as mathematical skills are crucial to understanding the subject. Constructivist Learning Theory (Vygotsky, 1978) emphasizes the importance of active, student-centered learning. It suggests that traditional lecture-based methods may not engage students effectively, and that hands-on experiments and real-world applications could help reduce aversion by making the subject more relatable and engaging. Together, these theories offer a framework for understanding how cognitive challenges, emotional barriers, and teaching methods contribute to students' aversion to physics.

Grounded in the theories and previous studies, the researcher decided to conduct this research to look deeper into the factors that contribute to students' aversion to physics. The conceptual framework of the study is shown in **Figure 1**.

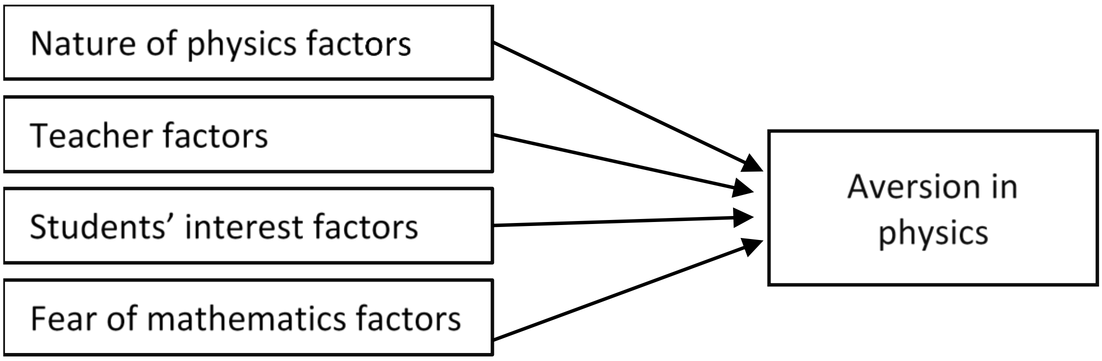

Figure 1. Research Framework

The framework consists of independent variables and a dependent variable. The independent variables, namely the nature of physics, the teacher, the interest, and the fear of Mathematics, are the hypothesized factors that cause aversion to physics among students. However, the independent variables do not necessarily mean that they all cause aversion in physics among students.

3. METHOD

3.1. Research Design

This study utilized a descriptive survey research design, which is commonly employed to collect and analyze data about individuals' attitudes, perceptions, or behaviors within a specific population. Survey research is particularly effective for describing the characteristics of a group and identifying relationships among variables, making it suitable for this study's aim of exploring students' aversion to physics. The data collection was conducted during the conclusion of the school year 2023-2024. A cross-sectional approach was adopted, where data were collected at a single point in time. This approach allowed for an efficient and accurate snapshot of students' attitudes toward physics during the specified period.

3.2. Research Instrument

The primary data for this study were collected using the Physics Aversion Survey Instrument (PASI), a 5-point Likert scale instrument developed by the researchers. The PASI was designed to measure students' aversion to physics and was consisted of 20 statements divided into four factors: Nature of Physics Factor (Statements 1–5), Teacher Factor (Statements 6–10), Students' Interest Factor (Statements 11–15), and Fear of Mathematics Factor (Statements 16–20). The instrument underwent exploratory factor analysis (EFA) and yielded factor loadings ranging from 0.638 to 0.864, demonstrating strong correlations between the statements and their respective factors. Moreover, the instrument has been pilot tested on the grade 10 students of MSU Institute of Science Education and yielded a high reliability index of 0.908 (Cronbach's alpha), indicating that the instrument is highly reliable for measuring aversion to physics among students.

3.3. Participants

The participants of this study were senior high school students enrolled in the Science, Technology, Engineering, and Mathematics (STEM) strand during the 2023-2024 school year at two public schools in Marawi City, Lanao del Sur, under the Department of Education (DepEd): Marawi City National High School and RPMD National Science High School. A total of 212 students were selected using purposive sampling, meaning that only those who were available and willing to participate were included, rather than through random selection. As a result, the sample may not be representative of the broader student population. Of the 212 participants, 116 students were from Marawi City National High School (comprising 57 Grade 12 and 59 Grade 11 students), and 96 students were from RPMD National Science High School (comprising 38 Grade 12 and 58 Grade 11 students). Data collection was conducted at a single point in time, after the 2023-2024 school year, providing a focused sample to examine factors influencing students' aversion to physics. However, the cross-sectional nature of the data limits the ability to observe changes over time.

3.4. Data Gathering

The data gathering process began with the researchers visiting the two schools involved in the study: Marawi City National High School and RPMD National Science High School. During these visits, request letters seeking permission to conduct the research were handed over to the respective school principals. After receiving approval, the researchers met with the Grade 11 and Grade 12 STEM students to inform them about the study's objectives and procedures. At this time, students were provided with permission forms to be filled out and signed by their parents or guardians, granting consent for their participation.

Although the Philippine Child Protection Policy requires parental consent only for participants below 18 years old, the researchers decided to require parental consent from all participants, regardless of age, as an additional ethical safeguard. Participation in the study was encouraged but entirely voluntary. The researchers assured the students that their identities would remain confidential and anonymous and that the results of the study would be published.

On the following day, students returned the signed permission forms, and the survey was administered. The Physics Aversion Survey Instrument (PASI) was distributed, and the researchers were present during the administration to address any questions or concerns raised by the participants. Out of the 247 students initially invited to participate, 212 students completed the survey, representing the final sample for the study. This systematic and ethical approach ensured the reliability of the data collected while upholding the participants' rights and confidentiality.

3.5. Data Analysis

After administering the survey instrument, the data were tallied in MS Excel and then referred to a certified statistician. The descriptive statistics, such as the frequency, percentage, mean, and standard deviation, were used to describe the causes and the levels of aversion to physics among the students. The major causes of aversion to physics were determined by computing the mean of each statement indicator. The levels of aversion to physics were determined using the scales in **Table 1** (adopted from literature (Abuan *et al*., 2024).

Table 1. Scale assigned to the responses of the participants (Abuan *et al*., 2024).

Responses	Value	Range	Interpretation
Strongly Agree	5	4.50 – 5.00	Very High
Agree	4	3.50 – 4.49	High
Neutral	3	2.50 – 3.49	Moderate
Disagree	2	1.50 – 2.49	Low
Strongly Disagree	1	1.00 – 1.49	Very Low

4. RESULTS AND DISCUSSION

4.1. Causes of Aversion to Physics

Table 2 presents the means of the statement indicators and their corresponding interpretations. As shown, the major causes of aversion to physics among participants varied in degrees across the 20 statement indicators.

Table 2. Means of the statement indicators.

Causes of Aversion to Physics	Mean	Interpretation
A. *Nature of Physics Factors*		
1. Physics concepts and principles are difficult to understand.	3.81	Agree
2. Problem-solving	4.62	Strongly Agree
3. Involvement of deeper analysis in problem solving	3.94	Agree
4. Memorization of many formulae/equations and units	4.12	Agree
5. Doing experiments/activities	2.24	Disagree
B. *Teacher Factors*		
6. The teacher is not entertaining and responding to students' questions.	2.43	Disagree
7. The teacher does not relate Physics concepts and principles to real-life situations.	3.22	Neutral
8. The teacher teaches the subject matter purely in a lecture-discussion approach	4.07	Agree
9. The teacher is giving numerous problem-solving assignments every week.	4.23	Agree
10. The teacher does not teach physics subject matter well.	2.77	Neutral
C. *Student's Interest Factors*		
11. Not interested in physics.	2.77	Neutral
12. Physics has no use in the livelihood/work I want to pursue.	2.84	Neutral
13. Not interested in becoming a scientist or an engineer	2.21	Disagree
14. Not interested in investigating things	2.91	Neutral
15. Not interested in solving physics-related problems in life	2.98	Neutral
D. *Fear of Mathematics Factors*		
16. Mathematics is involved in learning physics concepts and principles.	3.92	Agree
17. Mathematical computation is needed in solving physics problems.	4.10	Agree
18. Mathematical manipulation is involved in solving physics problems.	4.84	Strongly Agree
19. Many mathematical equations and formulas need to be memorized.	4.58	Strongly Agree
20. Not good at Mathematics	4.62	Strongly Agree

Note. 1.00 – 1.49 (Strongly Disagree), 1.50 – 2.49 (Disagree), 2.50 – 3.49 (Neutral), 3.50 – 4.49 (Agree), 4.50 – 5.00 (Strongly Agree)

4.1.1. Nature of Physics Factors

The data on the Nature of Physics Factors reveals a clear hierarchy of challenges that contribute to students' aversion to the subject. The most significant factor is problem-solving, with a high mean score of 4.62 (Strongly Agree), indicating that students overwhelmingly view the complexity of physics problems as a major difficulty. This suggests that the intricate nature of problem-solving and the cognitive load it imposes may be overwhelming for many students. The second most significant challenge is the memorization of numerous formulas, equations, and units, which received a mean score of 4.12 (Agree), reflecting that students also perceive this as a substantial barrier to learning. Additionally, the need for deeper analysis in problem-solving, with a mean score of 3.94 (Agree), is identified as a significant but slightly less burdensome factor. This suggests that while students recognize the importance of higher-order thinking, it is less intimidating than the demands of memorization and problem-solving. In contrast, the lowest mean was recorded for "Doing experiments/activities," which scored 2.24 (Disagree), indicating that students do not perceive hands-on activities as a major source of aversion to physics. This finding suggests that, despite the challenges posed by the theoretical aspects of the subject, students view practical, experimental components more positively and do not consider them a significant barrier to their engagement. Overall, the results highlight that the primary sources of students' aversion to physics are the cognitive demands of problem-solving and memorization, rather than the practical, experimental aspects of the subject.

The findings can be explained through the lens of cognitive load theory, which asserts that learners have a finite cognitive capacity to process information. According to this theory, when the cognitive demands of a task exceed the learner’s ability to manage and process the information, learning becomes less effective and more frustrating (Sweller, 1988). The high mean scores for problem-solving, conceptual understanding, and memorization of formulas suggest that students in Marawi City are experiencing a high intrinsic cognitive load due to the inherent complexity of physics concepts. This is particularly evident in the strong aversion to problem-solving, a task that requires students to not only understand abstract concepts but also apply them in unfamiliar contexts. Additionally, the memorization of formulas increases the extraneous cognitive load, further diminishing students' ability to engage meaningfully with the subject. However, the low mean for experiments and activities suggests that these more tangible and interactive aspects of physics are not perceived as cognitively demanding, which may explain why students found them less aversive. These results highlight the importance of managing cognitive load in physics instruction to ensure students can navigate the complexities of the subject without feeling overwhelmed.

These findings are consistent with several studies that highlight the central role of cognitive load in students’ aversion to physics. High school students often struggle with the abstract nature of physics, particularly in understanding concepts and applying them to solve problems, which parallels the current study's findings (Ekici, 2016; Kapucu, 2017). Additionally, physics students often experience frustration and disengagement when confronted with the demands of problem-solving, reinforcing the negative impact of high cognitive load on students' attitudes towards the subject (Astalini *et al*., 2019). Difficulties in memorizing formulas and equations were significant factors in students’ reluctance to engage with physics (Maxwell & Rose, 2022). Furthermore, laboratory experiments and hands-on activities were effective in boosting students' interest in physics, which supports the idea that practical, interactive learning experiences can help engage students and foster a positive attitude toward the subject. This suggests that, despite varying contextual factors, hands-on activities have a universally recognized potential to enhance student interest and understanding in physics.

4.1.2. Teacher Factors

The findings on Teacher Factors highlight several key issues contributing to students' aversion to physics. The most significant concern is the frequent assignment of problem-solving tasks, with a mean of 4.23, indicating that students feel overwhelmed by the regular workload. This suggests that the constant need to solve complex problems may add to their cognitive load, creating stress and frustration. The second most prominent issue is the teacher's use of a lecture-discussion approach, which received a mean of 4.07. This suggests that students may find this traditional teaching method less engaging and interactive, possibly preferring more hands-on or dynamic learning experiences that could help them better connect with the material. In contrast, the lowest mean scores were recorded for the statements "Teacher is not entertaining and responding to students' questions" (2.43) and "Teacher does not teach physics subject matter well" (2.77), both of which indicate that students generally disagree with these concerns. This implies that, despite their struggles with certain aspects of teaching, students do not view their teachers as unresponsive or ineffective in delivering the content. These findings suggest that while the teaching style may need adjustment, students still perceive their teachers as competent and engaged in facilitating their learning.

The findings can be interpreted through the lens of constructivist learning theory, which emphasizes the importance of active student engagement and the connection between classroom content and real-life experiences. According to this theory, when teaching methods are predominantly lecture-based and fail to incorporate real-world applications, students may become disengaged and develop negative attitudes toward the subject. The high aversion related to frequent problem-solving assignments aligns with cognitive load theory, which suggests that excessive cognitive demands, such as regular and challenging problem-solving tasks, can overwhelm students' working memory, leading to frustration and decreased motivation (Sweller, 2011). Furthermore, the neutral responses to questions about teacher responsiveness and the relevance of content to real life may reflect a disconnect between students' expectations for interactive learning and their experiences in the classroom. When teachers do not engage students through relatable examples or interactive strategies, students may struggle to see the practical value of what they are learning, thus exacerbating their aversion to the subject.

The findings from this study align with several existing studies that highlight the role of teacher-related factors in student attitudes toward physics. For example, students' negative attitudes toward physics were often linked to traditional (Reddy & Panacharoensawad, 2017; Laguindab *et al*., 2025) lecture-based teaching methods, which failed to foster active learning and engagement. The use of interactive teaching strategies, such as incorporating real-life applications and reducing excessive rote assignments, can improve students' perceptions of physics (Win & Nyunt, 2021). These findings support the idea that a shift towards more student-centered and applied learning approaches could alleviate some of the aversion to physics observed in the current study. On the other hand, previous research (Kwarikunda *et al*., 2020) presents a contrasting viewpoint, suggesting that frequent problem-solving assignments, while potentially demanding, are essential for developing a deep understanding and critical thinking in physics. This study argues that the challenge posed by regular assignments might foster resilience and improve problem-solving skills, thus helping students overcome initial aversion over time. In this light, the negative perception of numerous problem-solving assignments in the current study could reflect a short-term frustration that might eventually contribute to long-term learning gains if supported by appropriate instructional scaffolding.

4.1.3. Student's Interest Factors

In the domain of Student Interest Factors, most indicators were rated as Neutral, suggesting that these factors have a moderate and balanced influence on students' perception of physics. This indicates that while students' interests may have some effect on their engagement with the subject, it is not a dominant factor. The lowest mean score was recorded for the statement "Not interested in becoming a scientist or an engineer" (2.21), which was rated as Disagree. This suggests that students' disinterest in pursuing careers in science or engineering is not a significant cause of their aversion to physics. Students do not view their lack of career aspirations in these fields as a major barrier to their engagement with the subject. Consequently, the findings imply that factors other than career interests play a more influential role in shaping students' attitudes toward physics.

These findings can be understood through the lens of expectancy-value theory, which posits that students' interest and motivation in a subject are driven by their perceptions of its value and their expectations of success (Eccles & Wigfield, 2002). The neutral responses to the statements regarding the usefulness of physics and problem-solving in life suggest that students do not find strong value in physics, perhaps because they fail to see its immediate application to their personal interests or future career goals. However, the disagreement with the statement about becoming a scientist or engineer (mean = 2.21) implies that students may still hold some value for physics within the context of broader career aspirations, even if they are not particularly motivated by the subject itself. According to Vallerand (1997) self-determination theory, students are more likely to engage with and develop an interest in subjects that they perceive as personally meaningful and relevant to their goals. This could explain the relatively neutral to low interest in physics; students may not feel the subject is intrinsically motivating or aligned with their aspirations, but they may still see it as necessary for certain career paths.

The results of this study align with several other studies on student interest in physics. For instance, studies (Chang *et al*., 2018; Kwarikunda *et al*., 2020) found that students' motivation to study physics is often influenced by their perceptions of its practical relevance to their future careers. When students fail to see how physics connects to their desired career or everyday life, their interest in the subject tends to decrease. Many students, especially in non-STEM tracks, often view physics as abstract and unrelated to their future professions, which can contribute to low engagement and aversion to the subject (Astalini *et al*., 2019). On the contrary, studies (Toli & Kallery, 2021) suggest that when students are exposed to real-world applications of physics (such as in engineering or technological innovations), there is a significant increase in their interest and perceived relevance of the subject. In contrast to the findings in Marawi City, this highlights the potential for contextualizing physics education to spark student interest, particularly when students are made to see the practical applications of their learning in their future careers. Thus, while this study's results show neutral to low interest in physics, they also suggest that targeted interventions that link physics to career goals and practical applications might increase students' engagement and perceived value of the subject.

4.1.4. Fear of Mathematics Factors

The Fear of Mathematics factors emerged as a dominant influence on students' aversion to physics. The data revealed high mean scores for statements such as "Mathematical manipulation is involved in solving physics problems" (4.84), "Not good in Mathematics" (4.62), and "Many mathematical equations and formulas need to be memorized" (4.58), all of which were rated as Strongly Agree. These findings highlight that students strongly associate their struggles with physics with the mathematical demands of the subject. The high ratings suggest that students experience significant anxiety and discomfort when required to apply mathematical concepts in solving physics problems, viewing this as a major barrier to their understanding. Additionally, the need to memorize a large number of equations and formulas adds to the cognitive burden, intensifying their aversion to the subject.

The findings can be interpreted through the framework of mathematics anxiety theory and cognitive load theory. Mathematics anxiety refers to the feelings of tension and fear that many students experience when engaging with mathematics (Foley *et al*., 2017). This anxiety often extends into physics, where mathematics is integral to solving problems and understanding concepts. The strong agreement that "Mathematical manipulation is involved in solving physics problems" (mean = 4.84) highlights that students perceive mathematics as a major obstacle in learning physics. According to cognitive load theory, when students are already anxious about mathematics, the additional cognitive load of applying mathematical principles to physics problems can overwhelm their working memory, leading to frustration and aversion. Furthermore, the challenge of memorizing formulas and equations (mean = 4.58) fits within the theory of cognitive overload, which suggests that tasks requiring rote memorization or complex manipulation can deplete students' cognitive resources, hindering their ability to engage with the material in a meaningful way (Sweller, 2011). Additionally, the statement "Not good in Mathematics" (mean = 4.62) aligns with the concept of self-efficacy, where students' perceived lack of competence in mathematics may undermine their confidence and motivation to succeed in physics.

Several studies support the findings of this research. For instance, some researchers (Foley *et al*., 2017) emphasize the strong link between mathematics anxiety and students' struggles in physics, particularly in problem-solving situations where mathematical manipulation is required. Similarly, other researchers (Reddy & Panacharoensawad, 2017) found that students' negative attitudes toward physics often stemmed from their fear and lack of confidence in mathematics, suggesting that improving mathematical skills could alleviate some of this aversion. The strong association between mathematical manipulation and physics problem-solving observed in this study is consistent with the literature (Astalini *et al*., 2019), which found that students who struggled with mathematics often had difficulty engaging with physics, particularly in solving complex problems involving calculations and formulas. On the other hand, studies (Pasigon, 2024) present contrasting views, suggesting that students who are initially apprehensive about mathematics can still succeed in physics, with appropriate pedagogical interventions. For example, when students were given targeted support in bridging the gap between their mathematical and physics knowledge, their performance in physics improved significantly, which challenges the notion that math anxiety inevitably leads to physics aversion. Thus, while this study confirms the strong connection between mathematics difficulties and physics aversion, it also highlights the potential for interventions to mitigate this issue and foster greater engagement with both subjects.

4.2. Levels of Aversion to Physics

Table 3 presents the participants' levels of aversion in each main factor and the overall level of aversion. The data revealed varying levels of aversion across the four main factors.

The data reveal that the overall level of aversion to physics among senior high school students in Marawi City, Lanao del Sur, is classified as "High," with an average mean score of 3.561. Among the four main factors influencing this aversion, the Fear of Mathematics Factor emerges as the most significant, with the highest mean of 4.412, placing it in the "Very High" category. This indicates that students perceive mathematics-related challenges, such as problem-solving and memorization of formulas, as the greatest barriers to their engagement with physics. The Nature of Physics Factors follows closely with a mean score of 3.746, categorized as "High," highlighting that the complexity and cognitive demands of the subject contribute substantially to students' difficulties. Meanwhile, the Teacher Factors and Students' Interest Factors both fall into the "Moderate" category, with mean scores of 3.344 and 2.742, respectively. While these factors do contribute to students' aversion to physics, their impact is less pronounced compared to the mathematics-related challenges. Overall, the data underscores the central role that mathematics plays in students' negative perceptions of physics, while also pointing to the subject's inherent complexity and teaching methods as additional sources of difficulty.

Table 3. Level of aversion to physics.

Main Factors	Average Mean	Level
Nature of Physics Factors	3.746	High
Teacher Factors	3.344	Moderate
Student's Interest Factors	2.742	Moderate
Fear of Mathematics Factors	4.412	Very High
Overall Mean	3.561	High

Note. 1.00 – 1.49 (Very Low), 1.50 – 2.49 (Low), 2.50 – 3.49 (Moderate), 3.50 – 4.49 (High), 4.50 – 5.00 (Very High)

The data can be explained through cognitive load theory and self-efficacy theory. Cognitive load theory (Sweller, 2011) posits that students' ability to process and retain information is significantly affected by the complexity of the material they are learning. In the case of physics, the involvement of mathematics in solving problems (particularly mathematical manipulation) creates an additional cognitive load, which may overwhelm students' working memory, particularly when they already have low self-confidence in their mathematical abilities. This explains why "Fear of Mathematics Factors" received the highest rating, as students likely experience anxiety and mental fatigue when attempting to link abstract mathematical concepts with physical phenomena. Additionally, self-efficacy theory suggests that students who do not believe in their ability to succeed in mathematics are less likely to persist in physics, as they perceive the subject as an insurmountable challenge. This may also explain the relatively lower mean for "Students' Interest Factors" (2.742), as interest is closely tied to self-efficacy and prior experiences, such that students who struggle with mathematical components are less likely to develop an interest in physics. The "Nature of Physics Factors" further support this interpretation, as the cognitive complexity of physics concepts and principles can exacerbate existing fears or anxieties, leading to greater aversion to the subject.

Several studies corroborate the findings of this research. Students' anxiety about mathematics significantly hinders their ability to engage with physics, as they struggle to apply mathematical principles to physical problems (Foley *et al*., 2017). This study supports the high level of aversion attributed to "Fear of Mathematics Factors" in this study. Similarly, students who are not confident in their mathematical abilities tend to avoid physics, confirming the significant role of mathematics in students' aversion to the subject (Astalini *et al*., 2019). In contrast, some reports (Maxwell & Rose, 2022) highlighted the importance of teacher-related factors, finding that poor teaching practices and a lack of engaging pedagogy contributed to students' disinterest in physics. However, while teacher factors were ranked moderately in this study. More active and innovative teaching approaches could reduce physics aversion, particularly by addressing student disengagement (Maxwell & Rose, 2022). Teachers' ability to foster student interest and demonstrate the real-life applications of physics can improve students' attitudes toward the subject (Kapucu, 2017). This contrasts with the moderate mean for "Students' Interest Factors" in the present study, indicating that, while interest is important, it may be overshadowed by more immediate concerns, such as the difficulty of the subject matter and the role of mathematics in physics. These studies indicate that while teacher factors and student interest do influence aversion, they are not as strongly implicated as the fear of mathematics, which remains a critical barrier to physics engagement.

While the findings of this study provide valuable insights into the factors contributing to students' aversion to physics, several limitations should be acknowledged. The reliance on a survey method, while useful for gathering data, is subject to biases such as social desirability and the inability to capture the full complexity of students' experiences. Additionally, the study's focus on senior high school students from Marawi City limits the generalizability of the results to other regions or populations with different educational or cultural contexts. The participants were selected through purposive sampling, meaning that only those who were available and willing to participate were included, which further limits the generalizability of the findings. No random sampling was employed, so the sample may not be representative of the broader student population. The use of descriptive statistics also restricts the depth of analysis, as it does not explore causal relationships or the interaction between factors such as mathematics anxiety, cognitive load, and teaching methods. Moreover, the study primarily emphasizes mathematics-related challenges, without sufficiently considering other psychological, social, or environmental factors that may also shape students' perceptions of physics. Finally, the cross-sectional design limits the ability to track changes in students' attitudes over time, and the absence of subgroup analysis means that differences among academic tracks or demographic groups were not explored. Future research could address these limitations by employing mixed-methods approaches, longitudinal designs, and more granular analyses to offer a deeper understanding of the factors influencing students' aversion to physics.

5. CONCLUSION

This study revealed that senior high school students in Marawi City exhibit a high level of aversion to physics, primarily driven by fear of mathematics—especially challenges in mathematical manipulation, computation, and formula memorization. The complexity of physics concepts further intensified this aversion, while practical experiments were generally viewed positively. Teacher-related factors, notably lecture-based delivery and frequent problem-solving assignments, moderately contributed, whereas student interest had a lesser impact. Addressing this aversion requires targeted strategies, including reducing mathematics anxiety, providing structured and simplified problem-solving approaches, and incorporating interactive, real-life applications of physics. Such measures can enhance engagement, boost achievement, and sustain interest in physics, ultimately contributing to a stronger STEM pipeline.

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7. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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