INTERNATIONAL JOURNAL OF RESEARCH AND INNOVATION IN SOCIAL SCIENCE (IJRISS)
ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue IIIS December 2024 | Special Issue on Education

Exploring the Root Causes of Physics Aversion among Grade 12 STEM Students: A Qualitative Case Study at RPMD National Science High School

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DOI: https://dx.doi.org/10.47772/IJRISS.2024.803465S

Received: 09 December 2024; Accepted: 17 December 2024; Published: 15 January 2025

ABSTRACT

Physics aversion is a pervasive challenge in STEM education worldwide, significantly impacting students' engagement and performance and highlighting the need to understand its root causes to develop effective interventions. This qualitative case study explored the root causes of physics aversion among Grade 12 STEM students at RPMD National Science High School in Marawi City, Philippines. Ten Grade 12 students enrolled in the 2023-2024 academic year were selected through purposive sampling. Data were collected through one-on-one in-depth interviews to capture participants' perceptions and experiences with physics. The audio recordings were transcribed and analyzed using thematic analysis. From the data, 15 codes emerged, which were grouped into four overarching themes: Mathematical Challenges, Teaching-Related Issues, Language and Comprehension, and Personal and Social Factors. Key findings revealed that mathematical challenges, such as difficulty with complex equations, problem-solving, and formula memorization, were the most frequently cited barriers. These issues were often exacerbated by mathematics anxiety and inadequate foundational skills. Teaching-related issues, including ineffective instructional methods, disorganized presentations, and lack of engagement, significantly hindered students' understanding and interest. Language barriers, especially in decoding technical terminology and understanding word problems, compounded these difficulties. Personal and social factors, including a lack of interest in physics, peer influence, and perceived irrelevance to future career goals, further contributed to the aversion. The study highlights the urgent need for student-centered teaching approaches, such as active learning strategies, differentiated instruction, and linguistic scaffolding, to address these challenges. Policymakers and educators are encouraged to implement holistic interventions to create a more inclusive and supportive learning environment. Future research should investigate these dynamics across diverse educational contexts and assess the impact of targeted interventions on reducing physics aversion.

Keywords: Physics aversion, Mathematical challenges, Teacher-related issues, Language and comprehension barriers, Personal and social factors

INTRODUCTION

Aversion is defined as a strong dislike or disinclination [23]. In this study, aversion to physics refers to students' persistent reluctance or unwillingness to engage with the subject, which poses a significant challenge in science education globally. Particularly within Science, Technology, Engineering, and Mathematics (STEM) tracks, physics is often perceived as an abstract and mathematically demanding discipline, leading to diminished interest and engagement among students [3, 4]. These perceptions are further compounded by traditional teaching practices that emphasize rote memorization and procedural problem-solving over fostering conceptual understanding and real-world applications [27].

On a global scale, physics is frequently viewed by students as irrelevant to their personal lives and future careers, diminishing motivation to delve into the subject in depth [21]. This issue not only impacts individual academic success but also hinders the development of a scientifically literate workforce capable of addressing pressing societal challenges. In the Philippines, this phenomenon is reflected in similar trends. Studies within the country point to similar factors such as the abstract nature of physics concepts, the reliance on teacher-centered pedagogies, and limited access to experiential learning resources [24]. Additionally, challenges such as insufficient laboratory equipment and inadequate exposure to real-world physics applications exacerbate students' difficulties [15]. Cultural factors, such as the perceived difficulty of STEM-related subjects and societal pressures to pursue certain career paths, also contribute to physics aversion among Filipino students [16].

This dual global and local lens on physics aversion underscores the need for a transformative approach in teaching the subject. Strategies that incorporate student-centered learning, contextualized examples, and interdisciplinary approaches have been recommended to make physics more engaging and relatable [18]. Addressing this issue is vital, as fostering a positive attitude toward physics is crucial for nurturing a generation of STEM professionals who can contribute to global scientific and technological advancements.

Focusing on Grade 12 STEM students is timely and significant, as they play a pivotal role in the transition from secondary to tertiary education, particularly in science, technology, engineering, and mathematics (STEM) fields. At this stage, students' experiences and perceptions of subjects like physics heavily influence their career choices and willingness to pursue STEM-related professions [20]. In the Philippine context, the senior high school STEM strand is designed to prepare students for rigorous college-level science courses and careers. Having been exposed to introductory physics in the previous year level, the Grade 12 students can provide valuable insights into the subject's difficulties and their preparedness for advanced physics topics. This stage offers a critical opportunity to evaluate how teaching strategies, curriculum design, and other educational interventions shape learning outcomes [26].

Research Problem

The research problem centers on understanding why Grade 12 STEM students exhibit aversion to physics, despite being in a track that emphasizes science and mathematics education. This aversion is not merely an individual preference but a recurring issue that affects the academic performance and future career choices of students. Several factors contribute to this aversion, with many students reporting difficulty in grasping abstract concepts, especially those that require mathematical problem-solving [26, 28]. The perceived complexity of physics content, coupled with a lack of relevance to everyday life, often leads to disengagement [19]. Moreover, teaching methods that fail to connect theoretical knowledge with practical applications can exacerbate students' feelings of frustration and inadequacy [16]. In the Philippine context, this issue is particularly prominent in the STEM track, where students are expected to excel in science subjects, yet many still struggle with physics, leading to negative attitudes toward the subject and a reluctance to pursue STEM-related careers [26].

Research Objective

The study sought to explore the root causes of aversion to physics among Grade 12 STEM students at RPMD National Science High School during the school year 2023-2024. The research focused on uncovering the academic, psychological, and environmental factors that shape students' aversion to physics. Specifically, the study aimed to address the research question: *What are the root causes of aversion to physics among Grade 12 STEM Students?* This question aimed to capture students' perspectives on their difficulties and disinterest in the subject, drawing from existing research on factors such as perceived difficulty, relevance, teaching methods, and individual experiences [16, 19, 26, 28].

Theoretical Framework

The theoretical framework for this study is anchored in two key theories: Vygotsky's Zone of Proximal Development (ZPD) and Bandura's Social Cognitive Theory (1986). Vygotsky's ZPD emphasizes the gap between what students can accomplish independently and what they can achieve with appropriate guidance or support [31]. This theory underscores the importance of scaffolding in learning physics, where targeted interventions, such as step-by-step explanations or contextual examples, can help students navigate complex mathematical and conceptual challenges in physics. On the other hand, Bandura's Social Cognitive Theory highlights the role of observational learning, self-efficacy, and environmental influences in shaping students' attitudes and behaviors [2]. It provides a lens to understand how factors like peer influence, teacher modeling, and classroom environment contribute to students' perceptions of physics as difficult or irrelevant. Together, these theories offer a comprehensive framework to examine how instructional strategies, social interactions, and cognitive challenges interact to create or alleviate aversion to physics among STEM students. These insights guide the analysis of students' experiences and suggest strategies to enhance engagement and learning outcomes in physics education.

Conceptual Framework

The conceptual framework of this study integrates multiple factors to examine the root causes of physics aversion among Grade 12 STEM students. The framework is informed by the interplay between academic, psychological, and environmental dimensions, derived from existing literature and aligned with key theories. Academic factors include challenges related to mathematical problem-solving, conceptual understanding, and the perceived difficulty of physics as a subject [22]. Psychological dimensions address students' mathematics anxiety, lack of confidence, and perceptions of the subject's relevance to their future careers [33]. Environmental influences include teacher-related factors such as instructional methods, peer dynamics, and the availability of academic support [2, 14]. By examining these interconnected dimensions, the study aimed to provide a holistic understanding of the factors causing aversion to physics among students.

Significance of the Study

This study addresses the aversion to physics among Grade 12 STEM students, offering insights for educators, curriculum developers, and policymakers to improve teaching strategies and educational frameworks. For teachers, it emphasizes adopting student-centered approaches to boost engagement and learning outcomes [6, 14]. For curriculum developers, it underscores the need for physics content that integrates real-world applications and interdisciplinary connections, aligning with Sustainable Development Goal 4 on inclusive and quality education and SDG 9 on fostering innovation [30]. Policymakers can use these findings to address systemic issues like inadequate resources and teacher training. By addressing students' challenges and fostering their confidence in STEM careers, the study contributes to building a scientifically literate workforce capable of driving sustainable development, supporting the UN's 2030 Agenda [30].

METHOD

Research Design

This study adopted a qualitative case study approach to explore the root causes of aversion to physics among Grade 12 STEM students. A case study is particularly suitable for this research as it allows for an in-depth examination of a specific phenomenon within its real-life context [7]. In this case, the phenomenon is the aversion to physics, and the context is the physics classroom experiences of Grade 12 STEM students. Qualitative case studies enable researchers to gather rich, detailed data from a small sample of participants, facilitating the exploration of their personal experiences, beliefs, and perceptions regarding the subject matter [32]. This approach allows for a comprehensive understanding of the underlying factors influencing students' attitudes toward physics.

Participants

The study participants consisted of ten (10) Grade 12 STEM students, purposively selected from a class of 38 students. Purposive sampling is a non-probability sampling technique where participants are chosen based on specific characteristics that align with the research objectives [8]. In this case, the inclusion criteria for participants were as follows: (1) enrollment in Grade 12 STEM courses; (2) expressed aversion to physics, demonstrated by: (a) identifying physics as the subject they would most likely avoid when asked which subject they would escape, and (b) giving a negative rating of their interest in physics on a scale from -5 to +5; and (3) final grades below 80 in their Grade 11 physics subject. This selection ensured that the study focused on students most likely to provide relevant insights into the research question.

The choice of a sample size of ten (10) students is grounded in the nature of qualitative research, where depth of insight is prioritized over generalizability. A smaller, more focused sample allows for detailed exploration of the factors that contribute to physics aversion, which can be challenging to achieve with larger samples [8]. Additionally, a sample size of ten (10) is manageable for intensive qualitative methods such as interviews and case study analysis, providing enough data for thematic saturation without overwhelming the research process [12]. This sample size is sufficient to capture diverse perspectives within the specific context of Grade 12 STEM students while maintaining the richness and depth needed for meaningful analysis.

Data Gathering

The data were collected through one-on-one, in-depth interviews with ten (10) Grade 12 STEM students from RPMD National Science High School during the 2023-2024 school year. Each interview began with the primary question, "What are the root causes of your aversion to physics?" Follow-up questions were used to encourage further elaboration and to gain deeper insights into participants' experiences and perspectives. The study employed open-ended, semi-structured interviews to balance a consistent framework with the flexibility to explore unique and personal factors shaping the students' aversion to physics [6]. This approach allowed the researcher to capture a wide range of viewpoints while maintaining focus on the study's objectives.

To ensure accuracy and reliability, all interviews were audio-recorded after obtaining the participants' informed consent. Each student was briefed about the recording process, assured of confidentiality, and guaranteed anonymity to foster a comfortable and transparent environment. The audio recordings provided a rich resource for analysis, capturing detailed responses and subtle nuances. The semi-structured format also enabled the researcher to delve deeper into responses by asking follow-up questions, making the data collection process highly adaptable to the participants' unique experiences. Additionally, the interview guide was piloted with a small group of students from Marawi City National High School before the main data collection to refine the questions based on their feedback. This pilot process enhanced the clarity, reliability, and validity of the interview protocol, ensuring the collection of comprehensive and meaningful data [6].

Data Analysis

Data analysis was conducted using thematic analysis, a qualitative research method suitable for identifying patterns and themes within the interview data [6]. The process began by transcribing the interviews. Each interview transcript was reviewed twice to ensure accuracy. Afterward, the interview transcripts were carefully read and re-read by the researchers to familiarize themselves with the data. The next step involved breaking down each transcript into smaller and meaningful segments. Relevant segments were highlighted.

The next step involved grouping relevant segments and assigning initial code. The researchers engaged in an iterative process of reviewing and refining the codes. Afterward, related codes were grouped together based on their conceptual similarities, forming broader categories that encapsulated shared meanings. For example, codes like "difficulty with equations," "mathematics anxiety," and "formula memorization struggles" were consolidated into a theme named "Mathematical Challenges," reflecting participants' shared struggles in this area.

The next step involved naming the themes that emerged from groups of codes. This process involved revisiting the dataset multiple times to ensure that the themes accurately captured the data's essence. Preliminary theme names were assigned, serving as placeholders during the analytical process. Each theme was then further defined and analyzed to ensure its relevance to the research question and overall narrative. This stage includes assessing the relationships between themes, identifying overlaps, and refining their definitions to ensure clarity and coherence [8].

The researchers also considered how the themes contributed to understanding the central phenomenon being studied, maintaining alignment with the overarching research purpose. Through rigorous and reflective

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue IIIS December 2024 | Special Issue on Education

analysis, the researchers finalized the naming of the themes, ensuring that they provided a comprehensive and nuanced representation of participants' experiences [5]. This systematic approach enabled the researchers to uncover meaningful patterns and insights within the qualitative data.

Ethical Consideration

Ethical considerations are essential to ensure the integrity and credibility of the study. Informed consents were obtained from all participants before conducting interviews. The participants were fully informed on the study's purpose, procedures, and potential risks. The researchers ensured that the participants understood their participation is voluntary and that they can withdraw at any time without penalty [8]. The informed consent form outlined how the participants' responses will be used, and they were given the opportunity to ask questions about the research.

Confidentiality was rigorously upheld from the start of the study to its publication. Participants' identities were safeguarded, and no personal information was disclosed at any stage of the research. Pseudonyms were assigned to each participant during data analysis and reporting to ensure anonymity and prevent identification in the findings [8]. All interview data, including audio recordings and transcriptions, were securely stored in password-protected files accessible only to the researchers. After completing the transcribing, the audio recordings were permanently deleted to further protect participants' privacy. These measures ensured that participants' rights and privacy were respected consistently, fostering trust and adherence to ethical research practices.

RESULTS

Thematic analysis was employed in analyzing the data. This is suitable for identifying patterns and themes within the interview data [6]. This process involved transcribing the interview, breaking down the transcripts into segments, grouping related segments and assigning codes, grouping related codes thematically, and naming the themes.

Codes and Their Frequency

Based on the responses of the ten (10) participants regarding the root causes of their aversion to physics, fifteen (15) codes emerged. Table 1 below shows the codes and the frequency or the number of participants who reported it.

Table 1. Emerged Codes and Frequency

Codes	Frequency
1) Difficulty with mathematical equations	8
2) Struggles with problem-solving	8
3) Challenges with formula memorization	7
4) Lack of interest in physics	6
5) Ineffective teaching methods	6
6) Mathematics anxiety	6
7) Difficulty understanding word problems	5
8) Difficulty deriving and manipulating formulas	5
9) Weak English comprehension	4
10) Lack of a strong foundational knowledge	4

11) Boredom during lectures	4
12) Teacher's disorganized presentations	4
13) Negative influence of peers	3
14) Irrelevance of physics to future career	3
15) Influence of environmental factors	2

The data presented in Table 1 highlighted various factors contributing to students' difficulties in learning physics, as identified by their frequency of mention. The most commonly cited issues include difficulty with mathematical equations and problem-solving, both mentioned 8 times. This indicates a significant challenge in applying mathematical concepts within the context of physics. Similarly, struggles with formula memorization were mentioned 7 times, reflecting students' difficulty in recalling and applying numerous formulas critical for problem-solving.

Other notable concerns include mathematics anxiety, lack of interest in physics, and ineffective teaching methods, each mentioned 6 times. These factors illustrate both internal and external obstacles faced by students, such as their emotional response to mathematics and the role of instructional strategies in shaping their learning experiences. Challenges such as difficulty understanding word problems and deriving or manipulating formulas were each reported 5 times, indicating additional barriers in processing and utilizing information essential for physics learning.

Further issues include weak English comprehension, lack of a strong foundational knowledge, and boredom during lectures, each noted 4 times, pointing to broader academic and instructional challenges. Less frequently mentioned but still relevant were the negative influence of peers (3 mentions), the perceived irrelevance of physics to future careers (3 mentions), and environmental factors (2 mentions). Together, these factors provide a comprehensive overview of the diverse challenges that contribute to students' aversion to physics.

Themes That Emerged from The Codes

After generating codes, the researchers analyzed and grouped them based on conceptual similarities, forming broader categories with shared meanings. Themes were refined through repeated review of the dataset to ensure they accurately reflected the data and aligned with the research question. Preliminary names were assigned and later finalized to encapsulate each theme's essence. The Table 2 below presents the groupings of the codes and the corresponding theme that emerged.

Table 2. Groupings of Codes and their Corresponding Themes

Theme	Codes
Mathematical Challenges	Difficulty with mathematical equations
	Struggles with problem-solving
	Difficulty deriving and manipulating formulas
	Mathematics anxiety
	Difficulty with formula memorization
Teaching-Related Issues	Ineffective teaching methods
	Teacher's disorganized presentations
	Boredom during lectures
Language and	Difficulty understanding word problems

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue IIIS December 2024 | Special Issue on Education

Comprehension	Weak English comprehension
Personal and Social Factors	Lack of interest in physics
	Irrelevance of physics to future career goals
	Negative influence of peers
	Influence of environmental factors
	Lack of strong foundational knowledge in physics

DISCUSSION

The discussions are structured under the following thematic headings to reflect the primary challenges identified by participants: Mathematical Challenges, Teaching-Related Issues, Language and Comprehension, and Personal and Social Factors. Each theme is analyzed in-depth with theoretical frameworks and existing literature to contextualize and support the results.

Mathematical Challenges

The findings under the theme Mathematical Challenges reveal the significant difficulties participants face with the mathematical demands of physics, which act as a major barrier to their success in the subject. The participants consistently described the quantitative and formulaic aspects of physics as overwhelming. Respondent 3 shared, "*I struggle with formulas and computations. Even when I try to follow, I can't keep up,*" reflecting the frustration and confusion experienced by many students. Similarly, Respondent 7 stated, "*If math is not your strength, then physics feels impossible,*" underscoring the interconnectedness of mathematics and physics and how a lack of proficiency in one inhibits progress in the other.

These challenges align with Vygotsky's Zone of Proximal Development (ZPD), which emphasizes the necessity of scaffolding to help learners transition from what they can accomplish independently to what they can achieve with support [31]. For the participants at RPMD National Science High School, the gap between their current mathematical abilities and the demands of physics instruction is particularly pronounced. Without adequate scaffolding or interventions, students struggle to grasp foundational mathematical concepts that are integral to understanding physics. This gap is further exacerbated by limited resources and inconsistent teaching approaches in underfunded schools like RPMD NSHS, which mirrors broader educational challenges in the Philippines.

The data also reflect systemic issues in foundational mathematics education, particularly in less urbanized areas like Marawi City. Students often enter senior high school with varying levels of proficiency in algebra, trigonometry, and basic calculus, which are critical for tackling advanced topics in physics such as vector analysis, motion equations, and electromagnetism. This lack of preparation is evident in Grade 12, where students are expected to apply complex mathematical skills, but many struggle to meet these demands. Respondents' frustrations with these challenges echo broader findings [26], which show that inadequate foundational mathematics education significantly impacts students' ability to comprehend and apply physics concepts.

To address these challenges, the study highlights the need for integrating remedial mathematics support into physics instruction. At RPMD National Science High School, this could involve targeted tutoring sessions, individualized learning plans, and integrating basic mathematical skills into physics lessons. These strategies are particularly important for schools in resource-constrained settings like Marawi City, where the educational system must account for disparities in students' prior knowledge. Additionally, the use of contextualized learning materials, such as problems based on real-life situations familiar to students in Marawi City, could make abstract concepts more relatable and engaging.

Addressing mathematics anxiety is another crucial step. Research [22] suggests that creating a supportive environment and using incremental challenges can build numerical literacy and improve students' confidence in problem-solving. For instance, introducing collaborative activities or gamified learning tools could reduce the intimidation factor of mathematics within physics. By making physics less abstract and more applicable to everyday life, educators at RPMD NSHS can help demystify the subject and foster a sense of achievement among students.

Ultimately, reinforcing mathematical foundations while creating personalized, supportive learning environments is essential for improving students' physics performance at RPMD NSHS and similar schools in the Philippines. This dual approach not only enhances students' competency in physics but also nurtures their interest and engagement with STEM subjects. Furthermore, this strategy aligns with national educational goals of equipping students with the skills required for higher education and STEM careers, addressing both local and systemic challenges in Philippine science education.

Teaching-Related Issues

The findings under the theme Teaching-Related Issues emphasize the critical role that teaching methods play in shaping students' attitudes and experiences toward physics at RPMD National Science High School. Many participants expressed frustration with what they perceived as ineffective teaching methods, which they identified as a significant contributor to their aversion to the subject. For instance, Respondent 4 shared, "*Our teacher explains concepts like we're experts already. There's no time to ask questions,*" highlighting how rigid pacing and a lack of opportunities for clarification alienated students. Respondent 10 further remarked, "*It feels like the teacher is just reading slides without really teaching,*" underscoring the prevalence of passive, lecture-heavy instruction that limits student engagement and meaningful learning.

These concerns align with constructivist theories proposed by Piaget and Vygotsky, which emphasize that learning occurs most effectively when students actively engage with material through exploration, questioning, and collaboration. The findings suggest a disconnect between these principles and the instructional strategies employed in the physics classrooms at RPMD NSHS. Instead of fostering active participation and deep understanding, the reliance on traditional lecture methods appears to dominate. This observation is supported by existing literature [10, 14], which indicates that the quality of instruction—particularly its ability to encourage active student involvement—directly impacts motivation and academic performance.

In the local context of RPMD National Science High School, systemic educational challenges further complicate these teaching-related issues. Large class sizes, limited access to teaching resources, and the constraints of a rigid curriculum make it difficult for teachers to adopt more interactive and student-centered approaches. As reported by Respondent 10, the reliance on tools like PowerPoint slides, often used as substitutes for dynamic teaching, reflects the lack of access to modern instructional aids. These challenges are not unique to RPMD NSHS but are symptomatic of broader issues in Philippine public schools, particularly in underserved regions like Bangsamoro Autonomous Region in Muslim Mindanao. Teachers in these settings are frequently overburdened, with limited opportunities for professional development, making it difficult to adopt innovative strategies to engage students.

Another critical issue that emerged is the absence of differentiated instruction, a pedagogical approach that tailors teaching methods to address the diverse needs, abilities, and interests of students. Respondent 2 remarked, "*Some of us don't understand the topic, but the teacher moves on anyway,*" illustrating how uniform pacing in lessons disadvantages students who struggle to keep up. Differentiated instruction, as conceptualized by Tomlinson [29], emphasizes adapting content, processes, and assessments to accommodate varying learner profiles. However, the findings indicate that such strategies are rarely employed at RPMD NSHS. Instead, a one-size-fits-all approach predominates, leaving many students feeling inadequate and disengaged, further reinforcing their aversion to physics.

In the Philippine context, particularly in resource-constrained schools like RPMD NSHS, implementing differentiated instruction is often hindered by factors such as overcrowded classrooms, a lack of training for teachers, and a curriculum that prioritizes standardized content delivery over individualized learning. Despite these challenges, research [29] suggests that differentiated strategies, such as small group discussions, project-

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |Volume VIII Issue IIIS December 2024 | Special Issue on Education

based learning, and flexible assessments, can significantly enhance student engagement and comprehension. Tailoring lessons to include culturally relevant examples and localized contexts—such as physics applications related to Marawi City's environment or everyday experiences—can also help make the subject more relatable and meaningful to students.

To address these teaching-related issues at RPMD NSHS, there is a pressing need to invest in teacher professional development focused on active learning techniques and differentiated instruction. Training programs should equip teachers with skills to implement strategies that promote inquiry, collaboration, and real-world applications of physics concepts. For instance, incorporating hands-on activities, experiments, and interactive discussions can make lessons more engaging and accessible. Furthermore, providing teachers with access to digital tools, multimedia resources, and collaborative platforms can enhance classroom dynamics, even in resource-limited settings.

Reducing class sizes or introducing additional teaching assistants could also enable teachers to provide more individualized support, addressing the diverse learning needs of students. This is particularly crucial for those struggling with the mathematical and conceptual aspects of physics. Additionally, fostering a feedback-rich environment where students feel encouraged to ask questions and express difficulties can help build a more inclusive and supportive classroom culture.

By addressing these teaching-related issues, educators at RPMD NSHS can create a more engaging and equitable physics learning environment that supports student success. These improvements are especially relevant in the context of Marawi City, where rebuilding efforts after the siege include a focus on strengthening education to empower future generations. Enhancing the quality of teaching in physics aligns with broader national goals to improve STEM education in the Philippines and equip students with the skills needed to contribute to scientific and technological advancements. Such reforms not only address students' aversion to physics but also foster a generation of learners prepared to tackle complex global challenges.

Language and Comprehension

The findings under the theme Language and Comprehension underscore the significant role that linguistic challenges play in students' struggles with physics at RPMD National Science High School. Participants reported that the complex language and technical terminology used in physics created barriers to understanding and engagement. Respondent 6 shared, "*The technical words confuse me, and I can't connect them to what I know,*" while Respondent 8 stated, "*Word problems are the worst. They're written in English, and I just get lost.*" These statements highlight how difficulties in decoding technical vocabulary and academic language contribute to students' aversion to the subject. The findings reflect a broader issue in STEM education, where dense and specialized language often alienates students, especially in multilingual contexts like the Philippines.

This challenge aligns with Cummins' [9] distinction between Basic Interpersonal Communication Skills (BICS) and Cognitive Academic Language Proficiency (CALP). While students may be proficient in conversational English (BICS), many lack the CALP needed to engage with the academic demands of subjects like physics. CALP involves mastering complex, discipline-specific language, which is essential for understanding physics concepts, solving word problems, and engaging with abstract ideas. In the case of RPMD NSHS students, the gap between their conversational English abilities and the academic language required for physics appears to be a significant obstacle, leading to confusion and disengagement.

The issue is further exacerbated by the use of English as the medium of instruction, which, although official in Philippine schools, is not the first language for most students. At RPMD NSHS, where students may predominantly speak Maranao or other local dialects at home, English is often a second or even third language. This linguistic reality compounds the difficulty of learning physics, as students are required to navigate not only technical vocabulary but also complex sentence structures in a non-native language. Respondent 8's comment about being "*lost*" in English word problems illustrates how the combination of technical terminology and language unfamiliarity creates additional layers of cognitive load, making physics less accessible.

These findings resonate with research [11, 14] that highlights the dense, abstract language of STEM subjects as a significant barrier for non-native English speakers. The gap between conversational English and the higher-level academic English required for subjects like physics can lead to misunderstandings, frustration, and feelings of inadequacy. This challenge is particularly pronounced in the Philippine context, where English-medium instruction often assumes a level of linguistic proficiency that many students, especially those from rural or underserved areas, have not yet developed.

The lack of linguistic scaffolding in RPMD NSHS classrooms further exacerbates the issue. Effective scaffolding strategies, such as simplifying language, using glossaries, incorporating visual aids, and providing step-by-step guidance for solving word problems, are often absent due to resource limitations, large class sizes, and an emphasis on rote learning. Without these supports, students are left to navigate challenging texts and problems independently, resulting in confusion and disengagement. As [1] points out, providing linguistic scaffolding is critical in STEM education to bridge the gap between students' current abilities and the linguistic demands of the subject.

In the context of RPMD NSHS, where linguistic diversity adds another layer of complexity, addressing these barriers requires a localized, culturally sensitive approach. Students from Marawi City and nearby areas may have varying levels of exposure to English, making it crucial for teachers to adapt their instruction to accommodate these differences. Strategies such as bilingual glossaries that include Maranao or Filipino translations, the use of visual aids like diagrams and videos, and breaking down complex texts into simpler components can help make physics more accessible. Additionally, fostering interactive learning environments through group discussions, peer teaching, and hands-on activities can encourage students to articulate their understanding in both English and their native languages, building confidence and comprehension.

The integration of technology also offers promising solutions to address these challenges. Tools such as physics apps, interactive simulations, and educational videos with subtitles can provide visual and contextual reinforcement for technical terms and concepts. These resources allow students to engage with physics content in a more dynamic and less language-intensive manner, helping to bridge the gap between academic language and comprehension.

Ultimately, reducing language and comprehension barriers in physics education at RPMD NSHS requires a multi-faceted approach. Professional development for teachers is essential, equipping them with strategies for linguistic scaffolding and differentiated instruction. Training should focus on how to simplify technical language, integrate bilingual resources, and use multimodal teaching aids to enhance understanding. By making physics instruction more linguistically accessible and culturally responsive, educators can create a more inclusive learning environment that fosters student engagement and success in STEM. This is particularly critical in Marawi City, where empowering students through improved STEM education can contribute to broader efforts in rebuilding and advancing the local community.

Personal and Social Factors

The findings under the theme Personal and Social Factors emphasize the critical influence of students' perceptions and social dynamics on their engagement with physics at RPMD National Science High School. Many participants expressed a lack of connection between physics and their future aspirations. Respondent 9 remarked, "*I don't see how physics matters to my future, so it's hard to stay motivated,*" highlighting the perceived irrelevance of the subject to their personal and career goals. Additionally, social influences emerged as a significant factor, with Respondent 5 noting, "*Most of my friends don't like physics, and that affects me too.*" These insights demonstrate that students' attitudes toward physics are shaped by both personal beliefs and broader social contexts, with far-reaching implications for individual motivation and classroom dynamics.

From a theoretical perspective, Social Cognitive Theory (SCT) by Bandura [2] provides a valuable framework for understanding these findings. SCT posits that behaviors, attitudes, and perceptions are heavily influenced by observational learning and social modeling. In the case of RPMD NSHS, students' aversion to physics appears to be reinforced through peer dynamics, where negative attitudes toward the subject are shared and perpetuated. In Filipino culture, the concept of barkadahan (peer group dynamics) significantly shapes students' behaviors and preferences. If students' peers devalue physics or view it as unimportant, these attitudes are likely to be internalized, further discouraging engagement with the subject. This is particularly relevant in Marawi City, where strong communal ties influence both academic and non-academic decisions.

Another key factor contributing to students' disengagement is the perceived lack of relevance of physics to their future careers. Respondent 9's comment underscores a common sentiment among students who do not see physics aligning with their aspirations. Research by [17] supports this observation, indicating that when students perceive a subject as disconnected from their career goals, their motivation to learn diminishes. In the Philippine context, societal and familial expectations often steer students toward professions perceived as offering economic stability and prestige, such as medicine, law, or business. Physics, often seen as abstract and challenging, does not readily align with these aspirations, making it less appealing to students. This misalignment is further exacerbated in rural and resource-constrained settings like Marawi City, Lanao del Sur, where career exploration opportunities are limited, and students may lack exposure to the diverse applications of physics in modern industries.

The findings also highlight the importance of demonstrating the real-world applications of physics to enhance students' motivation and engagement. Research by [13] emphasizes that connecting physics to everyday life and societal challenges can significantly improve students' attitudes toward the subject. In the context of RPMD NSHS, where access to laboratory facilities and experimental learning is limited, teachers face the challenge of making abstract concepts relatable. Contextualizing lessons by linking physics to local or familiar scenarios—such as the physics behind mobile phones, transportation, or disaster resilience—can help students appreciate its practical value. For example, integrating discussions on how physics contributes to earthquake engineering or renewable energy solutions could resonate with students in Marawi City, Lanao del Sur, a community rebuilding after significant disruptions.

The cultural context of the Philippines adds another layer of complexity. Filipino students are often influenced by familial expectations and societal norms that prioritize traditional professions over STEM fields. Physics, in particular, is perceived as a niche subject that is only relevant to a narrow range of careers, which can lead to its devaluation even within academic settings. This perception not only affects students' individual motivation but also reinforces a collective attitude that discourages interest in physics. These cultural and systemic factors highlight the need for targeted interventions to shift these perceptions and demonstrate the broader value of physics.

Addressing these challenges requires both individual and social interventions. Educators must create a learning environment that emphasizes the relevance of physics to personal, societal, and global contexts. Collaborative learning strategies, such as peer discussions and group projects, can foster a supportive classroom culture where students feel encouraged to engage with the subject. For instance, involving students in community-based projects that apply physics principles—such as designing simple renewable energy systems or studying local environmental issues—can demonstrate its real-world significance. Peer-led initiatives, where students share positive experiences or achievements related to physics, can also counteract the negative influence of disinterested peers, leveraging the barkadahan dynamic in a constructive way.

Additionally, involving families in promoting STEM education is crucial. Family members play a significant role in shaping students' career aspirations and attitudes toward education. Schools can organize events, such as physics fairs or career talks, to showcase how physics can lead to diverse and fulfilling career opportunities. By highlighting success stories of Filipino physicists or professionals who have utilized physics in their careers, educators can help families and students appreciate the subject's relevance and potential.

The interplay of personal and social factors significantly influences students' attitudes toward physics at RPMD National Science High School. The findings underscore the importance of addressing students' perceptions of relevance, the impact of peer dynamics, and the role of cultural and familial influences. By implementing strategies that demonstrate the real-world applications of physics, foster supportive peer interactions, and engage families in the conversation, educators can help reduce students' aversion to the subject. These interventions are essential not only for improving engagement in physics but also for fostering a stronger interest in STEM fields, which is vital for the development of scientifically literate and future-ready individuals in the Philippines**.**

To wrap up, the study highlights four interconnected themes contributing to students' aversion to physics. Mathematical challenges were the most cited obstacle, underscoring the need for integrated math support in physics education. Teaching-related issues, including unengaging and non-inclusive practices, further exacerbated students' difficulties. Language and comprehension barriers emphasized the importance of linguistic scaffolding and simplifying physics texts. Finally, personal and social factors, such as peer influence and perceived irrelevance, shaped students' negative perceptions of the subject.

This study offers important insights into factors causing students' aversion to physics, but several limitations must be considered. The relatively small sample size of ten (10) Grade 12 STEM students limits the generalizability of the findings. While purposive sampling ensured relevance, the perspectives gathered may not fully represent a broader population, including students from other tracks or schools. Additionally, the sample being confined to a single educational institution further restricts the applicability of the results to diverse settings, given the unique teaching practices, resources, and culture of the school. Consequently, caution is necessary when attempting to generalize these findings to other schools, regions, or educational systems.

The study's context-specific nature also presents a limitation. The findings reflect experiences within the Philippine Department of Education framework and may not transfer directly to other countries or educational environments. Furthermore, the reliance on self-reported qualitative data introduces potential subjectivity and bias, as students' perceptions may have been influenced by memory recall or social desirability. The researcher's analysis of interview responses, despite efforts at maintaining objectivity, could inadvertently reflect interpretive biases. Lastly, the study primarily focused on academic and instructional factors, leaving emotional, psychological, and familial influences underexplored. Future research should address these gaps with larger, more diverse samples and a broader scope of inquiry to deepen understanding of the multifaceted nature of students' aversion to physics.

CONCLUSION

This study explored the challenges contributing to students' aversion to physics at RPMD National Science High School, identifying four key themes: mathematical challenges, teaching-related issues, language and comprehension barriers, and personal and social factors. These themes encapsulate the multifaceted nature of students' struggles, from difficulties with mathematical equations and problem-solving to ineffective teaching strategies that fail to engage and differentiate instruction. The findings also underscore the role of linguistic barriers in understanding physics concepts and the significant influence of peers and perceived irrelevance of physics in shaping students' attitudes. Through iterative coding and thematic analysis, the study captured a comprehensive narrative of how these factors interrelate to influence students' experiences, providing insights into the systemic issues within physics education.

RECOMMENDATION

Based on the findings of this study, several recommendations are made to address the challenges faced by students at RPMD National Science High School in their physics learning. First, enhancing mathematics support is crucial. As mathematical challenges significantly hinder students' ability to grasp physics concepts, it is recommended to integrate remedial mathematics programs, such as individualized tutoring, focused workshops, and the incorporation of basic mathematical principles into physics lessons. This dual approach would address the foundational gaps and help students build the necessary skills to succeed in physics.

Second, revising teaching methods is essential. Teachers should be trained in active learning strategies and differentiated instruction to cater to diverse learning needs. Emphasis should be placed on interactive lessons that encourage collaboration, critical thinking, and problem-solving, rather than relying solely on traditional lecture-based approaches. In classrooms with large numbers of students, providing additional teaching assistants or implementing group-based learning could provide the individualized attention necessary to improve student comprehension.

Third, addressing language barriers is a critical need. Given the multilingual context of the Philippines, it is recommended to introduce linguistic scaffolding techniques, such as bilingual glossaries, simplified language, and the use of visual aids, to bridge the gap between students' proficiency in conversational and academic English. By adapting teaching materials to the local context and providing linguistic support, students can better engage with the complex terminology of physics.

Furthermore, contextualizing physics content is highly recommended. Teachers should strive to connect physics lessons to real-life situations familiar to the students, such as local issues, community challenges, or everyday technologies. This approach not only enhances relevance but also stimulates student interest in physics by demonstrating its practical applications.

Lastly, improving social and personal engagement with physics is important. To address students' perceptions of physics as irrelevant to their career goals, teachers should incorporate career exploration and showcase how physics contributes to various fields, particularly those pertinent to the local community, such as engineering, renewable energy, and disaster resilience. Establishing positive peer influence through collaborative projects or peer-led discussions can also foster a more supportive learning environment.

Implementing these recommendations can significantly improve students' engagement, performance, and attitudes toward physics, contributing to the broader goal of enhancing STEM education in resource-constrained schools like RPMD NSHS and other similar institutions in the Philippines.

FUTURE RESEARCH DIRECTIONS

Future research could explore physics aversion across different educational levels and stages. Investigating attitudes toward physics in earlier grade levels or university settings could reveal how aversion develops and evolves over time. Longitudinal studies tracking students' experiences across various academic stages could uncover the long-term effects of early physics education and provide insights into the progression of students' attitudes toward the subject [6]. These studies would help illuminate how foundational experiences shape students' later engagement and success in physics.

Expanding the scope of future research to include larger and more diverse samples is also essential. Studies involving students from different types of schools, geographic regions, and educational contexts could provide a broader perspective on the factors contributing to physics aversion. Examining how differences in teaching methods, school environments, and students' prior exposure to mathematics and science interact with physics learning could enhance our understanding of the subject's challenges [8]. Additionally, targeted research on interventions, such as inquiry-based learning or technology integration, could evaluate their impact on reducing aversion and improving student engagement and performance in physics. By addressing these areas, future research can help develop evidence-based strategies to make physics education more accessible and appealing to diverse learners.

REFERENCES

1. Ardasheva, Y., Norton-Meier, L., & Hand, B. (2015). Negotiation, embeddedness, and non-threatening learning environments as themes of science and language convergence for English language learners. Studies in Science Education, 51(2), 201-249. https://doi.org/10.1080/03057267.2015.1078019
2. Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Prentice-Hall.
3. Barmby, P., Kind, P. M., & Jones, K. (2008). Examining changing attitudes in secondary school science. International Journal of Science Education, 30(8), 1075–1093. https://doi.org/10.1080/09500690701344966
4. Bennett, J., Lubben, F., & Hogarth, S. (2013). Bringing science to life: A synthesis of the research evidence on the effects of context-based and STS approaches to science teaching. Science Education, 91(3), 347–370. https://doi.org/10.1002/sce.20186
5. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa
6. Creswell, J. W., & Creswell, J. D. (2023). Research design: Qualitative, quantitative, and mixed

methods approaches (6th ed.). Sage Publications.

7. Creswell, J. W., & Plano Clark, V. L. (2018). Designing and conducting mixed methods research (3rd ed.). Sage Publications.
8. Creswell, J.W. and Poth, C.N. (2018). Qualitative inquiry and research design choosing among five approaches (4th ed). SAGE Publications.
9. Cummins, J. (1981). Bilingualism and minority-language children. Language Proficiency in Academic Contexts. Longman.
10. Darling-Hammond, L. (2015). The flat world and education: How America's commitment to equity will determine our future. Teachers College Press.
11. Fang, Z., & Schleppegrell, M. J. (2010). Disciplinary literacies across content areas: Supporting secondary reading through functional language analysis. Journal of Adolescent & Adult Literacy, 53(7), 587-597. https://doi.org/10.1598/JAAL.53.7.6
12. Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. Field Methods, 18(1), 59-82. https://doi.org/10.1177/1525822X05279903
13. Hazari, Z., Tai, R. H., & Sadler, P. M. (2010). Gender differences in the high school and affective experiences of introductory college physics students. Physics Education Research, 6(1), 1-14. https://doi.org/10.1119/1.2981292
14. Laguindab, M., & Basher, S. (2024). Interest and performance of Grade 10 students in science modular learning. International Journal of Science Education and Teaching, 3(3), 113–125. https://doi.org/10.14456/ijset.2024.10
15. Lomoljo, R. N. (2017). Predictors of the Performance and the Difficulties in Physics among Senior Students in Mindanao State University-External Studies: A Proposed Intervention Program. International journal of humanities and social sciences, 9(2)
16. Lumintac, M. T. Q. (2014). Students' Negative Attitude to Physics Influences Low Academic Achievement. IAMURE: International Journal of Education. 12(1), 1-1.
17. Lyons, T. (2006). Different countries, same science classes: Students' experiences of school science in their own words. International Journal of Science Education, 28(6), 591-613.
18. McDermott, L. C. (2001). Oersted Medal Lecture 2001: "Physics Education Research—The Key to Student Learning". Am. J. Phys. 69, 1127–1137. https://doi.org/10.1119/1.1389280
19. Müller, C. C., Kayyali, M. & ElZomor, M. (2024). Factors Driving and Impeding STEM Student Motivations and Success. https://doi.org/10.18260/1-2--47451
20. OECD. (2019). PISA 2018 Results (Volume I): What Students Know and Can Do. OECD Publishing. https://doi.org/10.1787/5f07c754-en
21. Osborne, J., & Dillon, J. (2008). Science education in Europe: Critical reflections. A Report to the Nuffield Foundation.
22. Osborne, J., Simon, S., & Collins, S. (2003). Attitudes towards science: A review of the literature and its implications. International Journal of Science Education, 25(9), 1049-1079. https://doi.org/10.1080/0950069032000032199
23. Oxford University Press. (n.d.). Aversion. In Oxford English Dictionary. Retrieved December 5, 2024, from https://www.oed.com
24. Panergayo, A. A. E., Gregana, C. F., Panoy, J. F. D., & Chua, E. N. (2023). Epistemological Beliefs and Academic Performance in Physics of Grade 12 Filipino STEM Learners. Jurnal Pendidikan Progresif, 13(1), 16-24. https://doi.org/10.23960/jpp.v13.i1.202302
25. Piaget, J. (1954). The construction of reality in the child. Routledge.
26. Ragudo, J. M. G. (2024). Logical thinking skills and problem solving skills of the Grade 12 STEM students of University of Northern Philippines: A basis for extension plan. International Journal of Research Studies in Education, 13(6). https//doi.org/10.5861/ijrse.2024.23077
27. Redish, E. F. & Burciaga, J. R. (2004). Teaching physics with the physics suite. American Journal of Physics, 72(3), 414-414. https://doi.org/10.1119/1.1691552
28. Sauro, K. (2024). Learning Strategies and Attitudes as Predictors of Problem-Solving Abilities of STEM Students in General Physics. International journal of research and innovation in social science, 8(7), 2461-2484. https://doi.org/10.47772/ijriss.2024.807194
29. Tomlinson, C. A. (2001). How to differentiate instruction in mixed-ability classrooms (2nd ed.). ASCD.

30. United Nations. (2015). Transforming our world: The 2030 Agenda for Sustainable Development. Retrieved from https://sdgs.un.org/2030agenda
31. Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.
32. Yin, R. K. (2018). Case study research and applications: Design and methods (6th ed.). SAGE Publications.
33. Zhang, J., Zhao, N., & Kong, Q. P. (2019). The relationship between math anxiety and math performance: A meta-analytic investigation. Frontiers in Psychology, 10, Article 1613. https://doi.org/10.3389/fpsyg.2019.01613