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vercoming Challenges Faced by Stem 12 Strand in Their Specialized Subjects

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Abstract. *This study explored the challenges Grade 12 STEM students face in them specialized subjects at Diplahan National High School. Utilizing a qualitative phenomenological approach, the research investigated the academic struggles, coping strategies, and external factors that affected student performance. Findings indicated that students faced difficulties in complex problem-solving, time management, and maintaining motivation in subjects such as Pre-Calculus, General Physics, and General Chemistry. To overcome these challenges, students employed self-regulated learning techniques, peer collaboration, and teacher support. The study emphasized the importance of academic interventions, adaptive teaching strategies, and institutional support in enhancing STEM education. The results provided valuable insights for educators, and future researchers in improving STEM learning outcomes.*

Keyword: *Grade 12 STEM Students, Science, Technology, Engineering, and Mathematics Strand, specialized subjects, overcoming*

Introduction

Science, Technology, Engineering, and Mathematics (STEM) education has received worldwide attention due to its ability to encompass science, technology, engineering, and mathematics, which are valuable in fostering problem-solving abilities, creativity, and divergent thinking, which make individuals prime candidates for innovation and leadership roles. Specialized STEM subjects such as General Biology1 & 2, General Chemistry 1 & 2, General Physics, Pre-Calculus, and Basic Calculus plays a significant role in shaping students' cognitive abilities and preparing them for careers in science, technology, engineering, and mathematics. According to Bybee (2013), a strong STEM foundation enhances students' problem-solving skills and critical thinking, making them more competitive in scientific and technological fields. Moreover, studies indicate that students who engage in rigorous STEM coursework are more likely to pursue STEM-related careers and contribute to innovation in various industries (National Science Foundation, 2018).

General Biology 1 & 2 introduces students to fundamental concepts in life sciences, including genetics, cellular biology, and ecology. Research by Freeman (2014) emphasizes that active learning in biology significantly improves students' retention and understanding of complex biological systems. Additionally, biology courses serve as a foundation for fields such as medicine, biotechnology, and environmental science, equipping students with essential skills in research and experimentation (Campbell, 2017).

Mathematics, particularly Pre-Calculus and Basic Calculus serves as the foundation of problem-solving and quantitative reasoning in STEM education. According to Kilpatrick (2001), students who develop strong mathematical skills are better equipped to analyze data, model real-world situations, and apply logical reasoning across different disciplines. Research also highlights that exposure to advanced mathematics in high school significantly improves students' performance in STEM-related college courses (Sadler, 2018).

General Chemistry and General Physics 1 & 2 provide students with a fundamental understanding of matter, energy, and their interactions. Studies by Cooper (2013) suggest that a strong background in chemistry fosters students' analytical and laboratory skills, essential for careers in medicine, engineering, and environmental science. Similarly, physics education enhances students' ability to understand natural laws, improving their capacity to engage in technological innovations and engineering problem-solving (Redish, 2003).

In 2011, after a series of consultations, discussions, and debates among experts and practitioners, the Philippines government agreed to enhance primary education in the entire archipelago called the K-12 basic education program by Republic Act 10157 (Cabansag, 2014). The new system is composed of 1 year in kindergarten at the age of 5, 6 years in elementary school, 4 years in junior high school (JHS) between 6 to 11 years old, and two years in senior high school (SHS) between 16 to 17 years. This was pushed through to develop Filipino learners' holistic 21st-century skills. In SHS, there are three major tracks: general academic,

sports and arts, and technical vocational and livelihood education. The additional two years help students master and prepare for the workforce aside from traditional thinking to make them ready for college life (Cabansag, 2014). Around 1.5 million grade 11 enrolled in 2016 all over the Philippines (Al-Samarrai, 2016).

Furthermore, the alarming poor achievement results in science which were documented for many years are also one of the reasons for enhancing the education curriculum in the Philippines (Magulod, 2017).

A student's self-perception can create barriers to participating in STEM activities if they do not identify with most participants. A student may react to implicit and explicit biases of other participants or program leaders. The lack of role models in the curriculum and program also directly impacts recruitment, engagement, and retention. If a student feels they are in a hostile environment, successful program engagement and retention are not possible (Ethan, 2022).

This study aimed to Overcome Challenges Faced by STEM 12 Strand In Their Specialized Subject At Diplahan National High School on March 2025. As students progress through the STEM strand, they encounter various difficulties that impact their academic performance, including complex subject matter, time constraints, and limited resources. These challenges can lead to stress, reduced motivation, and difficulty in mastering technical concepts.

This study seeks to identify the specific academic struggles of STEM 12 students and propose effective interventions to enhance their learning experience. By analyzing the factors that contribute to these difficulties, the research aims to develop strategies that will help students improve their problem-solving skills, manage academic stress, and adapt to the demands of their specialized subjects. The findings will serve as a guide to support students in excelling academically and overcoming the barriers they face in their STEM education.

Statement of the Problem

This study aimed to overcoming challenges faced by Science, Technology, Engineering, and Mathematics (STEM) 12 students' specialized subjects at Diplahan National High School in Diplahan, Zamboanga Sibugay in School Year 2024-2025.

Specifically, this study sought to answer the following questions:

1 What are the challenges encountered by the Grade 12 STEM students in their specialized subject? In what specific subject?
2 How do the Grade 12 STEM students overcome these challenges?
3 What are the challenges of the Grade 12 STEM students that they consider the most dominant in their specialized subject?

Results and Discussions

This study presents an analysis, and interpretation of the "Overcoming Challenges Faced by STEM 12 Strand in their Specialized Subjects". The findings highlight the challenges experienced, the coping strategies used to overcome them, and the effects these difficulties have on students' learning and academic achievement. This analysis aims to gain an understanding of how STEM education assists students in overcoming the challenges of their specialized fields and developing their academic progress.

Challenges Encountered by Grade 12 STEM (Science, Technology, Engineering, and Mathematics) Students

During the interview, the Grade 12 STEM students, gave insights and statements that highlighted the difficulties encountered in their coursework, with each theme emerging from their responses reflecting their unique perspectives on overcoming these challenges in the STEM curriculum.

Academic Challenges. The researcher gathered data from the interviews with the respondents. One to two respondents emphasized the subject of academic problems, especially in problem-solving, the researchers' collected data from the interviews. To overcome obstacles in their studies, they underlined the need for critical thinking, lifelong learning, and applying STEM knowledge. This entails deciphering intricate ideas, creating workable answers, and adjusting to demanding academic requirements. (SR1 & 10)

" One of the biggest challenges in specialized STEM subjects is the complexity of concepts and problem-solving in physics, and chemistry, which can be overwhelming sometimes. This affects learning by requiring extra time and effort to fully understand but sometimes leading to frustration and burnout.'

(SR1 & SR10 03/06/25)

SR1 and SR10 highlighted the difficulty in understanding complex STEM subjects like physics and chemistry, which often lead to frustration and burnout. This reflects Chatsworth International School's (2023) insight that students frequently struggle with "difficulty understanding new concepts," particularly as the level of complexity in subjects increases. According to the study, this is a common academic hurdle that requires learners to adapt through additional time and varied approaches to digest the material.

Furthermore, Akgün et al. (2014) emphasizes that science process skills like communication and measurement are essential, yet many students struggle with effectively utilizing them, which is critical in problem-solving tasks presented in STEM subjects.

Overcoming These Challenges by Grade 12 STEM (Science, Technology, Engineering, and Mathematics) Students

The researcher conducted interviews with Grade 12 STEM (Science, Technology, Engineering, and Mathematics) students, the researchers were able to learn from them their experiences and how they cope with these problems. The answers that the researcher got showed them recurring themes, most notably their motivation for taking the STEM strand.

Proactive Learning. The researcher gathered data from our interview, where one to two respondents pointed out academic challenges, especially in problem-solving. They stressed the need for proactive learning by acquiring critical thinking skills, continually broadening their knowledge, and using STEM concepts to manage intricate ideas, identify effective solutions, and accommodate demanding academic requirements. (SR1, SR2, SR8 & SR4)

"To overcome these challenges, I try to stay ahead by reviewing lessons (sometimes), practicing problems (sometimes), and seeking help from teachers or classmates when needed."

(SR2 & SR8 03/06/25)

SR1, SR2, SR4 and SR8 highlighted the importance of proactive learning as a coping strategy for academic challenges. Both respondents acknowledged the difficulty in problem-solving and expressed their need to stay ahead academically by reviewing lessons, practicing problems, and seeking help when necessary. This aligns with the strategies presented in the study of CHATSWORTH INTERNATIONAL SCHOOL (2023), which emphasizes the importance of developing effective study habits and collaborative learning to address academic difficulties such as time management and understanding complex concepts.

The respondents' emphasis on proactive learning reflects the STEM strand's goal of equipping students with critical thinking skills and the ability to handle intricate ideas, as stated in the literature. This approach is essential in helping students manage demanding academic requirements, aligning with the broader objectives of the SHS STEM curriculum, which integrates practical learning experiences to foster endurance and academic resilience (Andy, 2024).

"*I overcome these challenges by using active recall, practicing problems regularly, and seeking help from teachers or online resources*."

(SR3 03/06/25)

SR3 suggests using active recall, regular practice, and seeking help, aligning strategies from Chatsworth International School (2023) on effective study habits. This supports the STEM strand's goals of fostering critical thinking and independent learning. These methods help manage complex concepts and promote resilience, as highlighted in recent studies (Andy, 2024; Taips, 2024).

"*My strategies that I use to overcome these challenges is understand the topic, study, write down any important information, and review your work."*

(SR4 03/06/25)

SR4 highlighted a proactive and structured approach to learning. This aligns with the academic strategy of developing effective study habits, as discussed by Chatsworth International School (2023), where techniques like reviewing notes and consistent studying are encouraged as tools for academic success.

Difficulties Faced by Grade 12 STEM (Science, Technology, Engineering, and Mathematics) Students

As the researchers interviewed the Grade 12 STEM students, they gathered and examined their experiences regarding the challenges they are facing in their specialized subjects. The answers yielded useful information about the challenges that they are experiencing in their courses, with themes recurring as indicating their thoughts on overcoming such challenges within the STEM curriculum**.**

Impact of Scheduling. The researcher gathered data from the interviews, the theme of schedule's influence on their studies was indicated from one to ten respondents. They stressed the extent to which using time well becomes essential to align academic workloads, cultivate endless learning, and utilize STEM properly. Scheduling difficulties hamper their power in analyzing complicated challenges, crafting solution sets, and sustaining efficiency amid a scheduled higher education setup. (SR5 & SR9)

"One of my struggles in STEM is having Pre-Calculus first thing in the morning. Trying to wrap my head around complex formulas and problem-solving when I'm still half-asleep makes it even more challenging to stay focused and keep up with the lessons."

(SR5 & SR9 03/06/25)

SR5 & SR9 reported struggling with early morning STEM classes. This reflects challenges related to time management and concentration, particularly during early hours, which Chatsworth International School (2023) identifies as a common difficulty among students, recommending time management techniques and schedule adjustments.

Struggles of Procrastination. The researcher gathered data from the interviews, one to ten respondents talked about the issue of procrastination impacting academic performance. They pointed out how procrastination affects their capacity to handle workloads, memorize information, and be involved in stem learning effectively. Procrastination slows down their ability to address intricate problems, come up with viable solutions, and sustain productivity within the organized pressures of higher learning. (SR6 & SR7)

"In physics, where I procrastinated a certain activity but despite that I somewhat answered it kinda good."

(SR6 03/06/25)

SR6 admitted to procrastinating on a physics activity but still managed to perform reasonably. This demonstrates a typical academic struggle where students delay tasks but may still perform adequately highlighting the need for better time management and planning, as emphasized by Chatsworth International School (2023).

"A specific challenge I have experienced is grasping abstract physics theories like electromagnetism, which require both conceptual and mathematical comprehension."

(SR7 03/06/25)

SR7 described having trouble in understanding abstract physics concepts that require both conceptual and mathematical comprehension (SR7, 03/06/25). This type of challenge aligns with what literature identifies as a common barrier to learning complex topics. Chatsworth International School (2023) suggests that students facing such issues can benefit from peer collaboration, tutoring, and strategies that simplify or break down complex ideas.

Conclusion

In conclusion, Grade 12 STEM students have many challenges in their specialized subjects, such as intricate concepts, problem-solving issues, time management problems, and procrastination from time to time. These challenges, though demanding, help shape critical thinking, problem-solving skills, and resilience. Students use several strategies to accomplish these challenges, including proactive learning, help from teachers and classmates, persistent practice, and the use of metacognitive strategies to build understanding and performance. Their experiences underscore the significance of perseverance and flexibility, which not only contribute to their success in educational pursuits but also equip them for challenges in higher education and professional settings.

Recommendations

Based on the findings of the study, it was discovered that Grade 12 STEM (Science, Technology, Engineering, and Mathematics) students encountered various challenges in their specialized subjects. The following are the recommendations provided by the researchers:

1. Teachers – Adopt various teaching methods that engage interactive and practical learning strategies to meet the students' different learning styles. Feedback and counseling given on time may encourage the students to remain motivated and focused.

2. STEM students – Carrying out further research to investigate other strategies that can help STEM students overcome academic challenges and examine long-term effects on their academic and career achievement.

3. Parents – Support and encourage their children by providing a friendly learning environment at home and keeping channels of communication open for sharing academic setbacks and success.

4. Future Researchers – Offer more resources, workshops, and mentoring programs that enable students to acquire effective coping strategies to handle the intensity of STEM subjects.

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