



Perceptions of Senior High School Science, Technology, Engineering, and Mathematics (STEM) Students Toward STEM and Non-STEM Courses: A Comparative Qualitative Study

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ABSTRACT

The declining rate of STEM graduates in the Philippines has raised concern about students' academic preferences and decision-making processes. Perception plays a significant role in shaping these decisions, especially during the transition from high school to college. This study aimed to explore and compare the perceptions of senior high school Science, Technology, Engineering, and Mathematics (STEM) students toward both STEM and non-STEM courses. A qualitative comparative design was employed, involving in-depth interviews with ten purposively selected Grade 11 STEM students from Sultan Kudarat State University-Laboratory High School. Data were transcribed verbatim, validated by participants, and analyzed using comparative and thematic analysis. Findings revealed that students view STEM courses as offering more opportunities but perceive them as more complex and costly. In contrast, non-STEM courses were seen as more adaptable yet often undervalued. These perceptions influence students' course choices, highlighting the need for guidance programs. The study contributes localized insight into educational planning and career orientation strategies.

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1. INTRODUCTION

Perception refers to how we think about something or understand a certain idea. It involves awareness of the environment and is the connection of a person's cognitive contact with the world around them (Fodor & Pylyshyn, 1981). The impact of students' views and perceptions on their educational decisions, particularly in the transition from high school to college, is observed within the school setting. The influence of their perspectives on various subjects significantly shapes their choices, including the selection of college courses (Tudor et al., 2015).

A number of cases showed that students who graduated from the Science, Technology, Engineering, and Mathematics (STEM) strand pursued non-STEM courses in college, contributing to the declining rate of STEM graduates. Many reports regarding STEM have been developed (Ouyang & Xu, 2024; Joseph & Uzundu, 2024; Al Hamad et al., 2024; Sun et al., 2024; Yeung et al., 2024; Elbashir et al., 2024). In the global context, the United States has been experiencing a shortage of STEM workers and graduates. Research indicates a decline in students' interest in pursuing careers in STEM fields, as well as reduced engagement with STEM programs, leading to a decrease in the number of students opting for STEM-related careers (Bottia et al., 2015).

In the Philippines, the country has a considerably low figure of only 189 scientific professionals (Anito & Morales, 2019). Additionally, according to the Commission on Higher Education (CHED), based on the average five-year data from 2016 to 2017, there was a low completion rate across STEM areas, with only 21.10% of students graduating. This was confirmed by EduTECH in 2016 (see <http://asia.blog.terrapinn.com/edutech/2016/10/07/critical-challenge-growing-stem-education-philippines>), which highlighted the Philippines' workforce shortages in the STEM field.

In the local context, SOCCSKSARGEN is one of the regions in the Philippines with the least number of Science and Technology (SandT) workers, constituting less than 2% of the country's SandT professionals (see <https://opinion.inquirer.net/106429/stem-into-the-provinces>). The studies mentioned above provide valuable insights into the broader context of the declining rate of STEM graduates within international and national contexts. However, a gap exists in the literature regarding the comparative analysis of senior high school students' perceptions of STEM and non-STEM courses within a local context. This gap hinders our understanding of the specific factors influencing students' educational and career choices in particular regions or countries.

Hence, this study investigates the perceptions of senior high school STEM students toward both STEM and non-STEM courses. This research fills a knowledge gap by offering local insights into how such perceptions shape students' educational pathways. The study's novelty lies in its comparative lens and regional focus, while its impact rests in informing academic guidance programs and educational policy to better support students in making informed career decisions.

Hence, we intend to investigate the perceptions of senior high school STEM students in STEM and non-STEM courses. This seeks to fill the current gap in knowledge and literature and provide valuable insights specific to the local context. The study also analyzed how these perceptions may affect the student's future decisions, specifically in college courses.

Generally, the study employed a comparative analysis of the perceptions of senior high school STEM students towards STEM and non-STEM courses (Korpershoek et al., 2013).

Specifically, the study aims to answer the following questions:

- (i) What are the perceptions of senior high school students towards STEM and non-STEM courses?
- (ii) How do senior high school students view the significance of STEM courses in comparison to non-STEM courses according to their future objectives and aspirations?

2. METHODS

This study employed a qualitative research design using a method of comparative analysis and thematic analysis. Through these methods, the perceptions of senior high school students toward STEM and non-STEM courses were identified, as well as the similarities and differences of these views.

Ten purposively chosen senior high school students, specifically in the STEM strand and residing in Sultan Kudarat State University, Philippines, particularly in the municipalities of Isulan and Tacurong, were the participants of the study.

Moreover, participants were required to meet the following criteria:

- (i) officially enrolled as senior high school students in SKSU-LHS for the school year 2023–2024;
- (ii) must be taking the STEM strand;
- (iii) must have experience in academic science, engineering, technology, and mathematics subjects;
- (iv) must be willing to participate in the conduct of the study;
- (v) must be sure of the preferred course to pursue in college; and
- (vi) must have provided informed consent to participate.

The research study was conducted at Sultan Kudarat State University–Laboratory High School, ACCESS Campus, EJC Montilla, Tacurong City, Province of Sultan Kudarat, during the school year 2023–2024.

We sent a letter of approval to the Laboratory High School Principal. Once approved, the researchers prepared an interview guide with the assistance of their research adviser, and it was validated by three professional construct experts. Upon validation, the participants were identified using the inclusion criteria. The selected participants were given a letter of participation as well as informed consent before the conduct of study was conducted.

The one-on-one interviews were done virtually and face-to-face. The researchers explained the purpose of the study and oriented the participants on how the data would be collected. The interview was recorded using an audio recorder. The researchers transcribed the tapes, checked them for accuracy, and translated them into English. All utterances from the semi-structured interview were written verbatim in the transcription. Finally, it was subjected to data analysis.

3. RESULTS AND DISCUSSION

3.1. Perceptions of Senior High School STEM Students Toward STEM Courses

Results showed that in terms of perception toward STEM courses, students believed that by choosing a STEM course, they were positioning themselves for success in their future careers. Previous research ([Gul et al., 2023](#)) supports this, highlighting the advantages of STEM education, where students develop critical thinking skills, science process skills, and 21st-century competencies essential for industrial jobs.

While STEM education provides wide career opportunities, some students expressed concerns that may arise when choosing this path. They highlighted fairness and inclusivity issues, especially during the screening process for students applying to STEM courses. It was

noted that biases exist in the selection criteria, favoring applicants aligned with the STEM strand.

Students also believed that the high cost of STEM courses could hinder them from achieving their preferred careers. This is supported by previous reports (Sithole et al., 2017), which found that financial constraints are a potential challenge that can limit and influence a person's life decisions. As a result, some students opt for non-STEM careers due to financial limitations (Xu, 2013).

A key finding from the data analysis was the significant role society plays in shaping perceptions, particularly in influencing how students view STEM courses (Wang, 2013). The influence of stereotypes, beliefs, and social relationships generated consistent and meaningful responses from participants, revealing a complex interplay between societal expectations and students' perceptions of STEM education (Kim et al., 2018).

Moreover, due to difficulties in their current strand, some individuals begin to doubt their abilities to pursue their targeted courses, which can lead to a change in interest. Self-doubt was also cited as a contributing factor discouraging students from continuing with their preferred courses (Shedlosky-Shoemaker, 2015).

Lastly, when asked about the perceived difficulty of STEM courses, students responded that learning these subjects requires specialization in technical and objective disciplines, such as science and mathematics (Christensen, 2014).

3.2. Perceptions of Senior High School STEM Students Toward Non-STEM Courses

The perceptions of senior high school students focused on their insights toward non-STEM courses. Participants pointed out the biased or stereotypical treatment of society toward non-STEM fields. An example cited was the differing regard for STEM and non-STEM professions (Uddin, 2021). Jobs such as teaching were often compared to medical professions, highlighting a societal bias that considers doctors more important or prominent than teachers (Birden et al., 2013).

Non-STEM courses include studies in Business Management, Finance, Luxury, Fashion, and various other subjects. This leads to a disadvantage when a non-STEM student attempts to shift to STEM courses, as non-STEM education does not primarily focus on mathematical or analytical skills but rather emphasizes writing and communication. Conversely, non-STEM graduates have a wide range of available courses, such as psychology, philosophy, political science, education, and many more (Ganley et al., 2018).

Additionally, participants mentioned that stereotypes and biases toward non-STEM fields affect a student's perception and decision-making regarding these courses (Shin et al., 2016).

Lastly, they added that students' capabilities significantly influence how they approach subject matter (Kunter et al., 2013). The level of difficulty may vary depending on the student's interest, passion, dedication, and attitude in pursuing non-STEM courses.

3.3. Differences and Similarities of Senior High School STEM Students Toward STEM Courses

The comparison and contrast of senior high school STEM students' perceptions of STEM and non-STEM courses were categorized into four (4) themes: level of difficulty, financial capabilities, personal preferences, and family considerations.

In terms of the level of difficulty, students shared that STEM courses are more technical and objective (Herschbach, 2011). Compared to non-STEM courses, students believed that courses related to STEM are more expensive. This was one distinction that the participants emphasized.

In terms of personal preferences, participants expressed interest in both STEM and non-STEM courses. Family consideration also emerged as one of the key factors based on the data gathered. Previous research (Polenova, 2018) highlights the significance of parental values, parental pressure, and family obligations as essential components shaping individuals' career decision-making. In the same study, most parents were found to encourage their children to pursue medical and health-related courses. It was also emphasized that participants were not forced but rather “strongly encouraged” (Dai & Rappa, 2021).

3.4. Discussion

Pursuing a career is essential in an individual's life as it shapes their future. Students' perceptions significantly influence their decisions and selection of career paths (see <https://bluemonarchgroup.com/perception-and-decision-making-the-complex-relationship-between-perception-and-effective-decision-making%20.%>). STEM and non-STEM courses represent two distinct tracks in secondary education, where students develop personal views that may be shaped by external influences such as peers, family, and other social pressures (Polenova *et al.*, 2018). Understanding these perceptions leads to deeper insight into the factors that influence students' career goals. Making a secure and well-informed decision enables students to pursue courses that align with their aspirations (Tudor *et al.*, 2015).

As Grade 11 STEM students, the researchers conducted this study to determine the perceptions of STEM students toward both STEM and non-STEM courses, to understand how these perceptions affect decision-making—especially in the context of the declining rate of STEM graduates (Anito & Morales, 2019; Bottia *et al.*, 2015). Students' perceptions are a core factor in how they interpret and approach the process of choosing a career path, whether it is aligned with STEM or non-STEM fields.

Furthermore, the study aimed to compare and contrast students' perceptions of these two academic tracks. Through this process, the researchers were able to reflect and recognize how similarities and differences in perception could limit or support students in pursuing their intended careers (Austin, 2002). Ultimately, this study became an opportunity to cultivate open-mindedness and a better appreciation for diverse perspectives (Gul *et al.*, 2023).

4. CONCLUSION

Pursuing a career is a critical milestone in a student's life, as it shapes their future direction and aspirations. This study revealed that students' perceptions toward STEM and non-STEM courses are influenced by various external factors, including family, peers, financial capacity, and societal expectations. These perceptions play a significant role in shaping students' academic and career decisions. The comparative analysis highlighted that STEM courses are generally viewed as more technical, challenging, and costly, while non-STEM courses are seen as more adaptable and less valued by society. Despite these contrasts, students expressed interest in both fields, influenced by personal preferences and family considerations. Understanding these perceptions allows educators, guidance counselors, and policymakers to offer more targeted support and interventions to help students make informed and confident decisions. Ultimately, this study contributes to the broader conversation on educational planning and provides localized insight into how students navigate their career choices in the face of growing concerns about STEM graduate rates.

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6. 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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