Perception of Science, Technology, Engineering, and Mathematics (STEM) Learners Towards the Use of English as Medium of Instruction (EMI) in Senior High School Specialized Subjects

Aicel Joy Gorero Caballero[1], Wynzie Devine Antonio Diondo[2], Remia Pardilla Galgo[3], Jessa Lee Saladar Saligumba[4], and Rex Sargado Paulino[5]

[1,2,3,4,5]Iloilo State University of Fisheries Science and Technology (ISUFST)

[2,3]Teacher, Sacred Heart Academy, Inc. Zarraga, Iloilo, Philippines

***Abstract*—** This study explored the perceptions of Science, Technology, Engineering, and Mathematics (STEM) learners regarding the use of English as a medium of instruction (EMI) in Senior High School (SHS) specialized subjects. It aimed to (1) assess learners' overall perceptions based on gender and grade level and their significant differences. Moreover, this study identified the pedagogical implications based on the findings. Results showed that both male and female learners, as well as Grade 11 and Grade 12 learners, expressed positive views toward EMI. Their mean perception scores ranged from M=3.63, SD= 0.423) to M= 3.70, SD = 0.422, indicating general agreement that English supports learning in STEM subjects. Inferential statistics further revealed no significant difference in perception between grade levels ($t(181) = 1.08$, $p = 0.282$) and no significant difference across gender groups ($F(2,180) = 0.594$, $p = 0.553$). These results suggest that acceptance of English as the language of instruction is consistent among STEM learners regardless of gender or grade level. The findings affirm that English is widely valued as an effective tool for accessing complex scientific content. However, they also highlight the importance of continued pedagogical support to maximize comprehension and participation. Teachers are encouraged to sustain English-mediated instruction while integrating strategies that reinforce language skills, such as vocabulary scaffolding, interactive discussions, and multimodal learning activities. This study emphasizes the role of EMI in fostering academic readiness among STEM learners and provides insights to guide future instructional enhancements in SHS.

***Keywords*—** Education, English as Medium of Instruction (EMI), Language Learning, STEM Education, Student Perception.

1. INTRODUCTION

Language plays an essential role in the teaching and learning process, as it serves as the primary medium through which knowledge is communicated and understood (Cohen, Manion, & Morrison, 2022). In recent years, the use of English as a Medium of Instruction (EMI) has gained global attention, particularly in content-based courses where English is not the learners' first language. Several researchers have explored EMI's effects on learners' learning experiences, comprehension

2. METHODOLOGY

This study aimed to determine the perceptions of Science, Technology, Engineering, and Mathematics (STEM) learners toward the use of English as a Medium of Instruction (EMI) in senior high school specialized subjects particularly, Physics, Chemistry, Biology, and Pre-Calculus. Furthermore, it sought to examine whether significant differences existed in learners' perceptions when grouped according to their grade level and gender, and to draw pedagogical implications based on these perceptions to enhance teaching and learning in specialized STEM subjects.

A descriptive-survey research design was employed to collect quantitative data on learners' perceptions toward the use of English in teaching specialized subjects. The respondents were Science, Technology, Engineering, and Mathematics (STEM) strand learners from Grades 11 and 12 enrolled in a private secondary school during the school year 2024–2025. The sample size of 170 respondents was determined using the Raosoft sample size calculator to ensure a reliable representation of the Science, Technology, Engineering, and Mathematics (STEM) learner population. Respondents were chosen through stratified random sampling to achieve balanced representation by grade level and gender.

A survey questionnaire served as the main data-gathering instrument. The items were adopted from the

United International Journal for Research & Technology
Volume 07, Issue 01, 2025 | Open Access | ISSN: 2582-6832

study of Omar and Said (2021). The questionnaire underwent content validation by experts in English language teaching and educational research to ensure clarity and reliability. It was administered via Google Forms, allowing convenient and secure data collection. Participation was voluntary, and confidentiality of responses was maintained throughout the study.

The study employed a quantitative–qualitative research design to examine the perception of STEM learners toward the use of English as a medium of instruction (EMI) in Senior High School specialized subjects. Quantitative data were collected through an adopted survey questionnaire and analyzed using Jamovi software. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were utilized to determine the overall perception of the respondents. To test for significant differences in perceptions when grouped according to grade level and gender, the study employed an independent samples t-test and one-way ANOVA. Meanwhile, qualitative data gathered from semi-structured interviews with five purposively selected STEM learners were analyzed using thematic analysis, which identified recurring themes and insights that supported the quantitative findings. The integration of both data sets provided a comprehensive understanding of learners' perceptions. It led to the formulation of pedagogical implications aimed at improving English-mediated instruction in STEM specialized subjects.

In qualitative research, participants are intentionally selected based on their ability to provide rich, relevant, and diverse information about the phenomenon being studied. This process is known as purposive sampling. According to Creswell and Poth (2018), purposive sampling allows researchers to "select individuals and sites that can best help the researcher understand the problem and the research question."

In the context of this study, the criterion for choosing interviewees was based on specific characteristics relevant to the research objectives. The participants were required to be Senior High School learners from Grades 11 or 12 who were enrolled in STEM specialized subjects. They must have experienced learning through English as the medium of instruction in at least one specialized subject to ensure that they could provide meaningful insights related to the topic. Additionally, the interviewees were selected based on their willingness to share their experiences and perceptions in an interview setting, ensuring openness and authenticity in their responses.

This criterion ensures that the selected participants possess firsthand experiences relevant to the research topic and can provide meaningful insights into the pedagogical implications of using English as the medium of instruction.

III. RESULTS AND DISCUSSION

The results and discussion of this study present the quantitative and qualitative analyses of the data collected from STEM learners regarding their perception of English as a medium of instruction. The section outlines descriptive statistics, significant difference tests, and the thematic insights from interviews that reveal the pedagogical implications of these perceptions.

Table 1
STEM Students' Perception toward EMI by Gender

	Gender	Overall Perception
N	Female	118
	Male	64
	Prefer not to say	1
Mean	Female	3.67
	Male	3.66
	Prefer not to say	4.12
Standard deviation	Female	0.420
	Male	0.430
	Prefer not to say	NaN

Table 1 presents the overall perception of STEM learners toward the use of English as a medium of instruction in Senior High School specialized subjects when grouped according to gender. The findings reveal that female learners (n = 118) obtained an overall perception mean score of 3.67 (SD = 0.42), while male learners (n = 64) obtained a mean score of 3.66 (SD = 0.43). Respondents who preferred not to disclose their gender (n = 1) had a mean score of 4.12.

Based on the interpretation scale (3.41–4.20 = Positive Perception), both female and male learners exhibited a positive perception toward the use of Engli sh as a medium of instruction. This indicates that learners, regardless of gender, generally view the use of English in teaching specialized subjects as appropriate and beneficial to their academic learning (De Guzman & Tan, 2018).

The minimal difference between the mean scores of female and male learners suggests that gender does not substantially influence learners' overall perception of English as a medium of instruction. The slightly higher mean score among respondents who preferred not to state their gender, though based on a single case, also reflects a favorable view toward English use in instruction but does not meaningfully affect the overall group comparison due to the limited sample size.

Table 2
STEM Students' Perception toward EMI by Grade Level

	Grade Level	Overall_Perception
N	Grade 12-STEM	100
	Grade 11-STEM	83
Mean	Grade 12-STEM	3.70
	Grade 11-STEM	3.63
Standard deviation	Grade 12-STEM	0.422
	Grade 11-STEM	0.423

Range	Interpretation
4.21–5.00	Very Positive
3.41–4.20	Positive
2.61–3.40	Neutral
1.81–2.60	Negative
1.00–1.80	Very Negative

De Guzman, M. A., & Tan, J. P. (2018). *Practical Research 2.* Quezon City: Rex Book Store.

Table 2 presents the overall perception of STEM learners toward the use of English as a medium of instruction in Senior High School specialized subjects when grouped according to grade level. The results show that Grade 11 STEM learners (n = 83) obtained an overall perception mean score of 3.63 (SD = 0.423), while Grade 12 STEM learners (n = 100) obtained a mean score of 3.70 (SD = 0.422).

Based on the interpretation scale (3.41–4.20 = Positive Perception), both grade levels demonstrated a positive perception toward the use of English as a medium of instruction (De Guzman & Tan, 2018). This finding indicates that learners from both Grade 11 and Grade 12 generally view English as a suitable and beneficial medium for learning their specialized subjects.

Furthermore, the slightly higher mean score of Grade 12 learners suggests that they may be more accustomed and confident in using English for academic purposes compared to their Grade 11 counterparts. This could be attributed to their longer exposure to English-mediated instruction and greater familiarity with the language used in their chosen strand.

Nonetheless, the difference between the two means is minimal, indicating that both grade levels share comparable perceptions of English as a medium of instruction.

Table 3
STEM Students' Perception toward English as a Medium of Instruction by Grade Level

Independent Samples T-Test

		Statistic	df	p		Effect Size
Overall_Perception	Student's t	1.08	181	0.282	Cohen's d	0.160

Note. H_a $\mu_{Grade\ 12\text{-}STEM} \neq \mu_{Grade\ 11\text{-}STEM}$

Assumptions

Homogeneity of Variances Test (Levene's)

	F	df	df2	p
Overall_Perception	0.00278	1	181	0.958

Note. A low p-value suggests a violation of the assumption of equal variances

Group Descriptives

	Group	N	Mean	Median	SD	SE
Overall_Perception	Grade 12-STEM	100	3.70	3.56	0.422	0.0422
	Grade 11-STEM	83	3.63	3.56	0.423	0.0464

Table 3 presents the results of the independent samples t-test conducted to determine whether there is a significant difference in the perception of STEM learners toward the use of English as a medium of instruction when grouped according to grade level. The analysis revealed no statistically significant difference between the two groups, $t(181) = 1.08$, $p = 0.282$, Cohen's $d = 0.160$. This indicates that the perception of Grade 11 learners ($M = 3.63$, $SD = 0.423$) and Grade 12 learners ($M = 3.70$, $SD = 0.422$) toward the use of English as a medium of instruction did not differ significantly.

The result of Levene's test for equality of variances ($F = 0.00278$, $p = 0.958$) confirms that the assumption of homogeneity of variance was satisfied, validating the use of the standard t-test results.

These findings suggest that grade level does not influence learners' overall perception of English as a medium of instruction in Senior High School specialized subjects. Both Grade 11 and Grade 12 STEM learners maintain a similarly positive attitude toward the use of English for academic learning.

United International Journal for Research & Technology
Volume 07, Issue 01, 2025 | Open Access | ISSN: 2582-6832

Table 4

Perception toward English as a Medium of Instruction by Gender (One-Way ANOVA)

	Sum of Squares	df	Mean Square	F	p
Gender	0.213	2	0.106	0.594	0.553
Residuals	32.230	180	0.179		

Table 4 presents the results of the one-way analysis of variance (ANOVA) conducted to determine whether there is a significant difference in the perception of STEM learners toward the use of English as a medium of instruction when grouped according to gender. The results revealed that there was no statistically significant difference among the gender groups, $F(2, 180) = 0.594$, $p = 0.553$.

This finding implies that the perception of STEM learners toward the use of English as a medium of instruction does not vary significantly across gender identities (male, female, and those who preferred not to disclose their gender). In other words, regardless of gender, the respondents share a similar positive perception of English as a medium of instruction in their specialized subjects.

The result aligns with the descriptive statistics previously shown, where both male and female respondents recorded comparable mean scores. This suggests that gender is not a determining factor in shaping learners' attitudes or perceptions toward English as a language of instruction in the STEM strand.

The interview data revealed several pedagogical implications regarding the use of English as a medium of instruction in Senior High School specialized subjects. The responses highlighted that limited vocabulary and grammatical knowledge hinder some learners' ability to fully comprehend lessons delivered in English. This suggests that teachers should incorporate explicit vocabulary instruction and contextualized language support when teaching technical content in STEM subjects.

Additionally, learners expressed the need for clearer explanations and slower pacing, particularly when lessons involve complex terminologies. Teachers, therefore, should adopt scaffolded instruction and regularly assess understanding to ensure that learners can follow the lesson regardless of their English proficiency level.

Learners also emphasized the importance of visual aids and multimedia presentations, such as PowerPoint slides and diagrams, which enhance comprehension and make English-mediated lessons more engaging. Furthermore, some learners identified lack of confidence and limited exposure to English communication as major barriers. This implies that teachers should cultivate an inclusive and supportive classroom environment that encourages active participation in English without fear of error.

The pedagogical implications suggest that effective English-mediated instruction in STEM requires language-sensitive teaching, combining both content and language support to ensure meaningful learning. Teachers should balance the use of English with comprehension strategies to help learners bridge language gaps while mastering specialized content.

4. CONCLUSION

The study concluded that STEM learners generally hold a positive perception toward the use of English as a medium of instruction in Senior High School specialized subjects. No significant differences were found in perception when grouped according to gender and grade level, indicating that learners share similar attitudes toward English-mediated instruction. Qualitative findings revealed that while learners appreciate the use of English, they encounter challenges such as limited vocabulary, lack of confidence, and difficulty comprehending technical terms.

Overall, the results demonstrate that while STEM learners recognize the importance of English as a medium of instruction, effective teaching strategies and continuous language support remain essential to ensure full comprehension and engagement. This holistic understanding of learners' perceptions provides a valuable basis for improving English-mediated instruction and guiding future pedagogical practices in Senior High School.

ACKNOWLEDGMENT

First and foremost, we give our highest praise and deepest gratitude to Almighty God, whose divine guidance, wisdom, and strength have sustained us throughout the conduct of this study. His constant presence inspired us to persevere despite challenges and to never give up in fulfilling our goals.

We sincerely thank the School Principal and School Directress for granting permission to conduct this study and for their unwavering support throughout the process. Our deepest appreciation is also extended to the Sacred Heart Academy teachers for allowing us to take a portion of their time to introduce our research and explain its purpose, particularly in selecting our target respondents—the Grade 11 and Grade 12 STEM learners, who willingly participated and provided valuable responses.

We are likewise grateful to the parents for approving their children's participation in the study and for their cooperation during the data-gathering process. Our heartfelt thanks go to our validator, Ms. Cathy Pagayon, for ensuring the validity and reliability of our research instrument, and to the experts who provided insightful recommendations and professional advice that strengthened our study.

Our sincere gratitude also extends to our course facilitator, Mr. Rex Sargado Paulino, for his time, effort, and academic guidance. We recognize the contribution of Jamovi software, which served as an essential tool in analyzing our quantitative data accurately and efficiently.

Finally, we express our appreciation to our research team members, whose unity, dedication, and collaboration made this study possible.

REFERENCES

[1] Busca-Monteroso, J. M., & Baes, J. O. (2024). Students' attitudes toward learning English among senior high school STEM students in Siocon District, Division of Zamboanga del Norte: Basis for proposed intervention program. International Journal of English Literature Studies, 9(6), 218-226. https://doi.org/10.22161/ijels.96.35

[2] Cohen, L., Manion, L., & Morrison, K. (2022). Research Methods in Education (9th ed.). Routledge. https://doi.org/10.4324/9781315456539

[3] Contillo-Galang, J. (2022). English language proficiency and STEM strands: Senior high students. International Journal of Academic Multidisciplinary Research (IJAMS), 4(8), 64–74. https://www.ijams-bbp.net/archive/vol-2-issue-8-august/english-language-proficiency-and-stem-strands-achievement-of-senior-high-school-students/

[4] Creswell, J. W., & Creswell, J. D. (2023). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (6th ed.). SAGE Publications. https://s1.papyruspub.com/files/demos/products/ebooks/academicbooks/applied-linguistics/Preview-Research-Design-Qualitative-Quantitative-and-Mixed-Methods.pdf

[5] Creswell, J. W., & Poth, C. N. (2018). Qualitative inquiry and research design: Choosing among five approaches (4th ed.). SAGE Publications. https://uk.sagepub.com/en-gb/eur/qualitative-inquiry-and-research-design/book266033

[6] De Guzman, M. A., & Tan, J. P. (2018). Practical Research 2. Quezon City: Rex Book Store.

[7] Durand, J., & Munday, L. (2023). Functionalism in educational research: Examining the role of language in academic achievement. Journal of Educational Studies, 45(2), 115–130.

[8] Haq, I. U., Wasti, A. T., & Hassan, S. S. U. (2023). Perceptions of students and teachers about the practices of English as the medium of instruction at higher education level in Pakistan: A qualitative case study of Kohat University of Science and Technology. Pakistan Languages and Humanities Review, 7(3), 726–736. https://doi.org/10.47205/plhr.2023(7-III)63

[9] Lee, O., & Stephens, A. (2020). English learners in STEM subjects: Contemporary views on STEM subjects and language with English learners. Educational Researcher, 49(4), 281–289. 10.3102/0013189X20923708

[10] Peng, J.-E., & Xie, X. (2021). English-medium instruction as a pedagogical strategy for the sustainable development of EFL learners in the Chinese context: A meta-analysis of its effectiveness. Sustainability, 13(10), 5637. https://doi.org/10.3390/su13105637

[11] Omar, A. S., & Said, H. H. (2023). The use of English as a medium of instruction: Exploring the perceptions of ESL learners at Mindanao State University. TRANS-KATA: Journal of Language, Literature, Culture, and Education, 4(1), 6–21.[RP2] https://doi.org/10.54923/jllce.v4i1.57