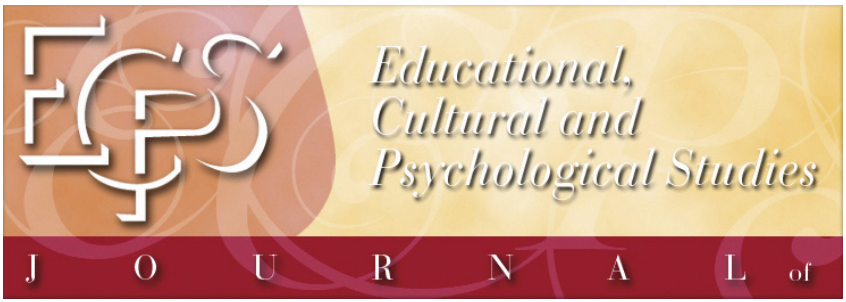

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Students' Perceptions of STEM: The Role of Demographic Variables and Socio-economic Status

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LA PERCEZIONE DEGLI STUDENTI DI STEM: IL RUOLO DELLE VARIABILI DEMOGRAFICHE E DELLO STATUS SOCIOECONOMICO

Abstract

Students' diminishing interest in science, technology, engineering and mathematics (STEM) courses and lack of qualified graduates in STEM fields continue to be an issue in the developing countries. A major factor is students find STEM subjects to be more challenging compared to the non-STEM subjects. This study specifically investigates Malaysian undergraduates' perceptions of STEM in relation to their demographics and socio-economic status. The descriptive analysis showed that students in this study have positive perceptions towards STEM subjects. They enjoy learning these subjects and agree that learning of one subject helps in learning of other STEM subjects. The inferential analysis showed statistically significant correlations between ethnicity, family size and fathers' occupations with students' perceptions of STEM. On the other hand, gender, parents' education, mothers' occupations, and parents' income are not statistically correlated with students' perceptions of STEM. Future studies are needed to determine underlying factors contributing towards the declining number of students in STEM fields despite their positive perceptions of STEM subjects.

Keywords: Developing countries; Ethnic; Gender; STEM education; Sustainable development.

1. Introduction

In recent years, science, technology, engineering, and mathematics (STEM) education has become a focal point in educational research and policy discussions, given its critical role in fostering innovation, economic development, and global competitiveness. STEM was originally formed to advance a political goal and, at first, covered all four unique disciplines, with a stronger focus on science and mathematics in the schools (Freeman *et al.*, 2019). Later, in addition to non-STEM courses, the integrated-STEM education comprised of at least two STEM subjects. Regardless of the different subject combinations, STEM education prepares graduates for the current and future employment market (Kayan-Fadlelmula, 2022; Salvetti *et al.*, 2023), and thus is a driver for social and economic growth (Lee *et al.*, 2019). STEM education develops sustainable knowledge-based professionals with essential job skills including digital literacy, creative thinking, design thinking, reasoning abilities and collaborative skills (Lee *et al.*, 2019; Hacioglu & Gulhan, 2021; Kayan-Fadlelmula, 2022; Ichsan *et al.*, 2023; Sungur Gul *et al.*, 2023). STEM education positively impacts STEM in general by increasing the interest, motivation, and attitude towards STEM (Sungur Gul *et al.*, 2023). The active, authentic, and practical learning that students experience in STEM education shapes their approach towards sustainable development (Sungur Gul *et al.*, 2023). STEM education not only improves students' performance in STEM subjects but also in non-STEM subjects. STEM graduates are able to apply their integrated knowledge and skills of science, technology, engineering, and mathematics to solve real life problems especially when sustainable development goals are incorporated into the STEM education (Kayan-Fadlelmula, 2022; Jamali *et al.*, 2023; Sungur Gul *et al.*, 2023).

STEM education molds students into innovators and problem solvers, preparing them for the challenges of the twenty-first Century by providing them with real-world learning opportunities (Rifandi & Rahmi, 2019; Ates & Gunduzalp, 2023). STEM education is crucial for a country's economic growth because it strongly emphasizes practice and invention and promotes creativity and divergent thinking. The importance of effective pedagogical approaches in shaping students' perceptions of STEM education must be acknowledged. Active learning strategies, inquiry-based instruction, and collaborative learning environments have been associated with increased student engagement and interest in STEM. Furthermore, the role of educators as facilitators and motivators cannot be overstated in influencing students' attitudes toward STEM. The challenges of STEM

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education are from the pedagogical, curriculum, students, teachers, and assessment aspects (Sungur Gul *et al.*, 2023). These include the design of the instructional materials and activities, complementing students' interest, increasing teacher efficiency, and providing trainings and professional development courses for the teachers (Sungur Gul *et al.*, 2023).

STEM fields are dynamic, and the curriculum may not always keep pace with the latest developments. An emphasis on outdated material may fail to prepare students for the rapidly evolving demands of the job market. Various educational interventions and outreach programs have been implemented to address the challenges associated with students' perceptions of STEM subjects. Enrichment programs, mentorship initiatives, and community engagement have shown promise in promoting positive attitudes toward STEM. However, studies consistently report declining number of students interested in STEM education, as they progress through educational levels (Kumar *et al.*, 2023). This contributes to the decreasing number of trained workers in the STEM sectors, as seen in STEM studies (Markus *et al.*, 2021). Identifying and addressing barriers to STEM education is crucial for promoting inclusivity and diversity. Studies point to challenges such as inadequate resources, lack of representation in STEM fields, and the perception of STEM as difficult or unattainable. Mitigating these challenges requires a multifaceted approach, including policy changes, curriculum reform, and targeted support. Addressing the challenges associated with attitudes, motivations, and experiences is vital for creating an inclusive and equitable STEM learning environment.

The advancement of STEM in developing countries is consistent with the Sustainable Development Goals of the United Nations for quality education. In Malaysia, STEM education efforts aim to improve students' scientific and mathematical literacy (Rifandi & Rahmi, 2019) and their ability to think critically and solve problems (Idris *et al.*, 2023b). Some of the nation's initiatives to develop and advance STEM are the National Science, Technology and Innovation Policy, the National Biotechnology Policy, and the Malaysia Education Blueprint (2013-2025) (Idris *et al.*, 2023a). Despite this, there are persisting issues such as scarce resources and gender disparities in STEM (Idris *et al.*, 2023b), lack of hands-on STEM instructions over theory-only instructions (McIntyre *et al.*, 2021), lack of exposure to STEM careers (Vela *et al.*, 2020), and teachers' lack of knowledge and expertise in incorporating STEM into learning (Rifandi & Rahmi, 2019). Due to these problems, fewer secondary school students were enrolling in STEM courses from 2016 to 2019 and then again from 2020 to 2021, with 2021 recording the lowest enrollment in the mentioned period (Idris *et al.*, 2023b). This study investigates how Malaysian

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students perceive STEM disciplines in an attempt to understand why students' interest in STEM education and careers is waning.

2. Literature review

The increased research interest in STEM education is driven by continuous effort to promote STEM education across the globe. Numerous studies highlight the significance of student perceptions in shaping their academic experiences (e.g., Hacioglu & Gulhan, 2021; Rahman *et al.*, 2022). STEM subjects are often perceived as challenging, leading to a fear of failure or a lack of interest among students. Changing this perception and making STEM more accessible is essential for encouraging participation, interdisciplinary approaches, and global collaboration. The educational system may not always foster these collaborative skills, which are increasingly important in the professional world. Literature reveals a complex interplay of factors influencing students' attitudes toward STEM subjects including gender stereotypes, cultural biases, and societal expectations. Studies consistently report a decline in interest and confidence in STEM subjects as students progressed through educational levels particularly among female students and students from the minority groups (e.g., Johnson *et al.*, 2021). Educational interventions have shown promise in addressing the negative perceptions of STEM education. Motivation is a key determinant of STEM engagement.

Past studies have underscored the impact of early exposure to STEM activities and positive role models on students' motivations and career aspirations (e.g., Smith & Jones, 2019). The perceived relevance of STEM to real-world issues emerged as a consistent theme. Effective pedagogical approaches play a crucial role in shaping STEM perceptions. Active learning strategies, inquiry-based instructions, and collaborative learning environments (Freeman *et al.*, 2019) have been associated with increased student engagement and interest in STEM. Understanding students' perceptions of STEM subjects is crucial for educators, policymakers, and researchers as it directly influences students' engagement, performance, and pursuit of STEM-related careers. While previous research has explored factors contributing to STEM interest and achievement, a comprehensive examination of the role played by demographic variables and socio-economic status in shaping students' perceptions remains limited, especially in the developing countries (Abe & Chikoko, 2020). Malaysia understands the importance of offering STEM education to its students as the global

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need for STEM specialists increases (Idris *et al.*, 2023b). But for a variety of reasons, including the fact that they find STEM topics challenging, the country is confronted with the problem of students choosing to pursue occupations and studies outside of STEM fields.

Therefore, this study seeks to address the gap by offering an in-depth analysis that incorporates up-to-date empirical evidence aligned with the evolving landscape of STEM education. The study investigates the possible relationships between students' perceptions of STEM courses and demographic variables and socioeconomic status. Demographic variables, such as gender, ethnicity, and academic background, have been recognized as influential factors in shaping students' attitudes towards STEM subjects. Moreover, socio-economic status has been identified as a crucial determinant that may affect students' access to educational resources, opportunities, and ultimately, their perceptions of STEM disciplines (e.g., Ersan & Rodriguez, 2020; Sovansophal, 2020; Yong *et al.*, 2023). To contribute meaningfully to the ongoing discourse, this paper adopts a multifaceted approach, considering the intersectionality of these variables and their collective impact on students' perceptions of STEM subjects.

3. Research design

3.1. *Research objectives*

This cross-sectional study primarily investigates students' perceptions of STEM subjects using a quantitative approach. The study also investigates if there are correlations between the demographic variables and the variables of socio-economic status with the perceptions. Thus, the three research questions are:

1. What are students' perceptions of STEM subjects?
2. Are there correlations between demographic variables and students' perceptions of STEM?
3. Are there correlations between students' socio-economic status and their perceptions of STEM?

3.2. *Sample of participants*

The participants of this study are undergraduates from ten different public and private higher education institutions in Malaysia. The researchers

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gathered 300 responses, physically and electronically, from several universities throughout the central, southern, northern, east coast and west coast regions of Malaysia. Given that the sample participants come from all the regions, this provides a reliable representation of the population of undergraduate students in Malaysia.

3.3. *Instrumentation*

The instrument used in this study is a survey questionnaire that is adopted and adapted from Guzey *et al.* (2014). The original instrument measured students' attitudes toward STEM and STEM careers on a five-point Likert scale. With reference to Appendix 1, the questionnaire used in this study consists of five items on students' perception of science (S1-S5), five items on students' perception of technology (T1-T5), five items on students' perception of engineering (E1-E5) and five items on students' perception of mathematics (M1-M5). Cronbach's alpha value of the twenty items is found to be $\alpha = 0.93$, which indicates reliability since is higher than the reliability standard cutoff of 0.70. Additionally, a value of more than 0.90 denotes excellent item internal consistency.

3.4. *Analysis method*

Descriptive and inferential analyses were performed using *Statistical Package for Social Sciences* (SPSS), version 24. The first research question is answered using descriptive analysis while the second and the third research questions are answered using inferential analysis. In particular, the descriptive analysis involves median and frequencies and the inferential analysis involves Cramer's V.

4. Results and discussion

4.1. *Perceptions of STEM*

Students' perceptions of the four STEM subjects are analyzed using: (1) median and (2) frequencies of responses, in the form of percentages and clustered bar chart. The Likert-scale responses used in the questionnaire

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are: 1. Strongly Disagree (SD), 2. Disagree (D), 3. Neutral (N), 4. Agree (A), and 5. Strongly Agree (SA).

Median for responses

With reference to *Table 1*, the median for all items are 3 or 4. Especially all items about students' perceptions of technology and all items about students' perceptions of engineering recorded median 3. This indicates students have a neutral perception of these two subjects. Meanwhile, all the items about students' perceptions of mathematics and all the items about students' perceptions of science recorded median 4, indicating that more than 50% of the respondents have positive perceptions towards science and mathematics.

Table 1. – Median for responses.

Median	Items
3	T1, T2, T3, T4, T5, E1, E2, E3, E4, E5
4	S1, S2, S3, S4, S5, M1, M2, M3, M4, M5

Perceptions of science

It is evident from the clustered bar chart displayed in *Figure 1* that respondents have positive perceptions towards science. The bars for *Strongly Agree* and *Agree* are higher than the bars for the other three options.

The total percentage of responses for options *Strongly Agree* and *Agree*, in descending order, are shown in *Table 2*. While all items have more than 50% positive responses, items S1 and S3 recorded more than 70% of positive responses. This shows that the respondents enjoy learning science and feel science helps them to learn the other three subjects.

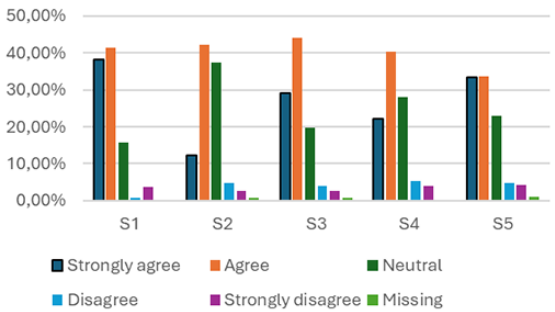

Figure 1. – Perceptions of science.

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Table 2. – Positive responses for science.

Items	Positive responses
S1	79.6%
S3	73.0%
S5	67.0%
S4	62.3%
S2	54.6%

Perceptions of technology

Figure 2 shows that respondents generally have positive perceptions towards technology. The two highest bars are for options *Strongly Agree* and *Agree* for items T1, T3, T4 and T5. Although the two highest bars for item T2 are *Agree* and *Neutral*, the positive responses still have higher percentages than the negative responses.

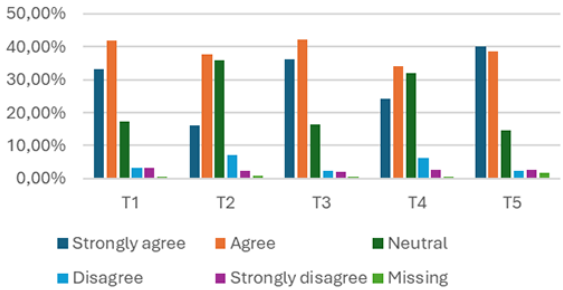

Figure 2. – Perceptions of technology.

Table 3 shows that all items recorded more than 50% positive responses. Items T1, T3 and T5 have more than 70% positive responses. The respondents enjoy learning technology and feel technology helps them to learn the other three subjects. The respondents largely agree the importance of having technological knowledge to secure a good job in the future.

Table 3. – Positive responses for technology.

Items	Positive responses
T5	78.7%
T3	78.6%
T1	75.3%
T4	58.3%
T2	53.7%

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Perceptions of engineering

Figure 3 shows that the highest response for all the items for perceptions of engineering is *Neutral*. In addition, the second highest response for items E1, E3 and E5 is *Agree* while the second highest option for items E2 and E4 is *Disagree*. Since the bars for the negative responses *Disagree* and *Strongly Disagree* are higher for some of the items, *Table 4* displays both the total percentages for both the positive responses and negative responses.

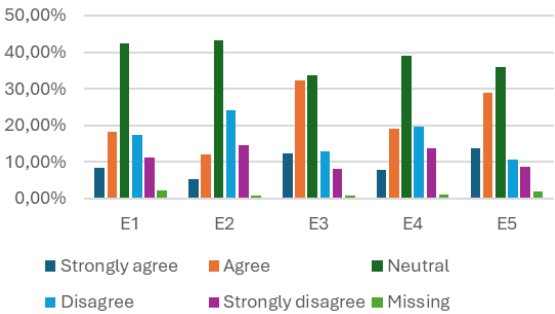

Figure 3. – Perceptions of engineering.

Unlike science and technology, *Table 4* shows less than 50% of positive responses towards the engineering subject. Although respondents agree that learning engineering is important to get a good job and helps them to learn the other three subjects, many respondents feel they are not good at engineering and are not interested in taking up more engineering lessons.

Table 4. – Responses for engineering.

Items	Positive responses	Negative responses
E3	44.6%	21.0%
E5	42.7%	19.4%
E4	26.7%	33.4%
E1	26.6%	28.6%
E2	17.3%	38.7%

Perceptions of mathematics

Figure 4 clearly shows that students have highly favorable perceptions of mathematics because the bars for all the items are higher on the left-hand

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sides. Items M1, M3 and M5 have highest response for *Strongly Agree* and second highest response for *Agree*. Item M2 recorded the highest response for *Agree* and second highest response for *Strongly Agree*. Meanwhile, item M4 recorded the highest response for *Strongly Agree* and the second highest response for *Neutral*.

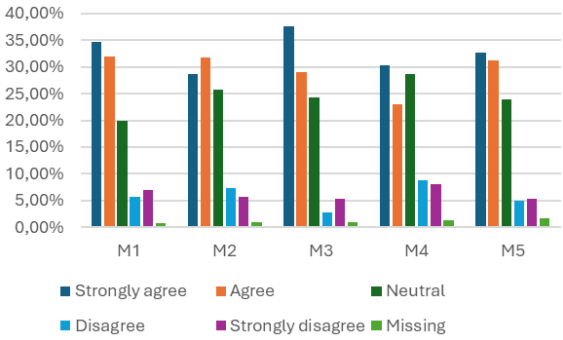

Figure 4. – Perceptions of mathematics.

Table 5 shows that all items have more than 50% positive responses and that most respondents enjoy learning mathematics and feel that mathematics helps them to learn the other three subjects. However, the percentage is less than 70% compared to science and technology.

Table 5. – Positive responses for mathematics.

Items	Positive responses
M1	66.7%
M3	66.7%
M5	64.0%
M2	60.4%
M4	53.3%

4.2. *Demographic variables and perceptions*

The demographic variables investigated in this study with relation to students' perceptions of STEM subjects are gender, ethnicity, and family size. *Table 6* shows the distribution of male and female respondents in the sample whereby there are more female students (66.3%) than male students (33.7%). For the hypothesis statements:

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H_0: there is no significant correlation between gender and perceptions,
H_a: there is significant correlation between gender and perceptions,
it was found that there is no significant correlation between gender and students' perceptions of STEM, $r(298) = .48$, $p > 0.05$.

Table 6. – Distribution of gender.

	Number (n)	Percentages (%)
Male	101	33.7%
Female	199	66.3%

Table 7 shows the percentages of students from the different ethnic groups. For the hypothesis statements:
H_0: there is no significant correlation between ethnicity and perceptions,
H_a: there is significant correlation between ethnicity and perceptions,
there is a statistically significant correlation between ethnicity and students' perceptions of STEM, $r(298) = .52$, $p < 0.05$.

Table 7. – Distribution of ethnicity.

	Number (n)	Percentages (%)
Malay	222	74.0%
Chinese	36	12.0%
Indian	26	8.7%
Others	16	5.3%

With reference to *Table 8*, for the hypothesis statements:
H_0: there is no significant correlation between family size and perceptions,
H_a: there is significant correlation between family size and perceptions,
there is a statistically significant correlation between family size and students' perceptions of STEM, $r(298) = .52$, $p < 0.05$.

Table 8. – Distribution of family size.

	Number (n)	Percentages (%)
1 – 3 people	20	6.7%
4 – 5 people	120	40.0%
More than 5	160	53.3%

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4.3. *Socio-economic status and perceptions*

The variables of socio-economic status investigated in this study with relation to students' perceptions of STEM subjects are parents' education, parents' occupations, and parents' income (Krishnan *et al.*, 2023) as shown in *Figure 6*. Appendix 2 shows the distribution of parents' highest qualifications obtained from Krishnan *et al.* (2023). For the hypothesis statements:
H_0: there is no significant correlation between parents' education and perceptions,
H_α: there is significant correlation between parents' education and perceptions,
it was found that there is no significant correlation between fathers' academic qualification and students' perceptions of STEM, $r(298) = -.03$, $p > 0.05$, and between mothers' academic qualification and students' perceptions of STEM, $r(298) = .03$, $p > 0.05$.

Appendix 2 shows the distribution of parents' occupations which follows the International Standard Classification of Occupations of the United Nations (Krishnan *et al.*, 2023). For the hypothesis statements:
H_0: there is no significant correlation between parents' occupation and perceptions,
H_α: there is significant correlation between parents' occupation and perceptions,
it was found that there is no significant correlation mothers' occupation and students' perceptions of STEM, $r(298) = .49$, $p > 0.05$. However, there is a statistically significant correlation fathers' occupation and students' perceptions of STEM, $r(298) = .52$, $p < 0.05$. The results above show that there is a correlation only between fathers' occupation and students' perceptions of STEM.

Appendix 2 shows the distribution of parents' income (refer to Krishnan *et al.*, 2023). For the hypothesis statements:
H_0: there is no significant correlation between parents' income and perceptions,
H_α: there is significant correlation between parents' education and perceptions,
it was also found that there is no significant correlation between parents' income and students' perceptions of STEM, $r(298) = .02$, $p > 0.05$.

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5. Conclusion

The descriptive analysis shows that students in this study have positive perceptions towards STEM subjects which are in conformity with other studies (e.g., Caspi *et al.*, 2019; Kressler & Kressler, 2020). More importantly, students enjoy learning science, technology and mathematics and acknowledged that learning one of these subjects helps them to learn the other two subjects. However, although students agree that learning engineering is important and helps to learn other STEM subjects, they are less interested in taking engineering classes and find it less enjoyable. Interestingly, although more than three quarters of the sample of respondents enjoyed learning science and technology, only half of them perceived themselves to be good in these subjects. They also do not see themselves to be good at engineering and mathematics. In addition, despite saying that they enjoy learning mathematics the students are not interested in taking up more mathematics lessons.

The correlation analysis between the demographic variables and students' perceptions of the STEM subjects showed a statistically significant correlation between ethnicity and perceptions, and between family size and perceptions. However, unlike other studies that found gender as an important variable in studies related to STEM education (e.g., Evans *et al.*, 2020; Jeffries *et al.*, 2020), this study found no correlation between gender and students' perceptions of STEM. With regards to the variables of the socio-economic status, this study found a statistically significant correlation between fathers' occupations and students' perceptions of STEM. There was no statistically significant correlation between parents' education, mothers' occupations, and parents' income with students' perceptions of STEM.

6. Implications of study

STEM education plays a pivotal role in fostering innovation, economic growth, and societal advancement. Understanding the perceptions of students in STEM disciplines is essential for educators, policymakers, and researchers aiming to enhance STEM education. Despite the declining number of students in STEM related courses and decreasing number of graduates interested in STEM workforce, this study shows that students have positive attitudes towards STEM subjects. They have interest in the STEM subjects and acknowledge the importance of STEM subjects to

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their careers. However, the sample size of 300 undergraduates represents less than 1% of the population of undergraduates in Malaysia. As of April 2022, the total number of students enrolled in the 20 public higher education institutions in Malaysia is 590 254 students while there were 517 580 students enrolled in the 434 private higher education institutions (MOE, 2022), totaling up to more than one million student population in the whole country. A larger scaled study in future may provide a more accurate representation of Malaysian undergraduates' perceptions of STEM.

By employing a quantitative research design and drawing on a diverse and representative sample, this study aims to provide insights into the intricate relationships between demographic variables, socio-economic status, and students' perceptions of STEM subjects. Still, there is a need to identify mediating and underlying factors that result in students' declining interest in STEM. Since students have positive perceptions of STEM subjects, there are contributing factors for the declining participation in STEM courses and careers. Identifying these reasons is the first step in improving the number and strengthening STEM in the country. Another scope for future research is the effects of mediating factors on students' perceptions of STEM subjects and how does this mediating factors change with respect to the background of students and their learning environment. Also, timeline of the respondents enrollment into undergraduate programs as those who enrolled during the recent pandemic may response more favorably towards STEM education due to the online learning (e.g., Oladele *et al.*, 2023).

The findings of this research are anticipated to inform educational policies, curriculum development, and intervention strategies aimed at fostering inclusivity and equity within STEM education. As the demand for STEM professionals continues to rise globally, understanding the factors influencing students' perceptions of STEM subjects is paramount. This article contributes to the existing body of knowledge by the associations of demographic variables and socio-economic status with perceptions od STEM, ultimately offering evidence-based recommendations for promoting a more inclusive and equitable STEM education landscape. Future research should focus on longitudinal studies, exploring the long-term impact of interventions and identifying innovative strategies to enhance students' perceptions in STEM fields. By fostering positive attitudes and motivations, educators and policymakers can contribute to a more diverse and skilled STEM workforce, ultimately advancing societal progress.

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APPENDIX 1

Items in the questionnaire

S1 I enjoy learning science.
S2 (I think) I am good at science.
S3 Learning science helps me learn mathematics, engineering, or technology.
S4 I am interested in taking more classes that involve science.
S5 It is important to know science to get a good job.
T1 I enjoy learning to use technology.
T2 (I think) I am good at using technology.
T3 Using technology helps me learn science, mathematics, or engineering.
T4 I am interested in taking more classes that involve technology.
T5 It is important to know technologies to get a good job.
E1 I enjoy learning engineering.
E2 (I think) I am good at engineering.
E3 Learning engineering helps me learn science, mathematics, or technology.
E4 I am interested in taking more classes that involve engineering.
E5 It is important to know engineering to get a good job.
M1 I enjoy learning mathematics.
M2 (I think) I am good at mathematics.
M3 Learning mathematics helps me learn science, engineering, or technology.
M4 I am interested in taking more classes that involve mathematics.
M5 It is important to know mathematics to get a good job.

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APPENDIX 2
Distribution of parents' data

Distribution of parents' highest academic qualifications

Academic qualification	Father	Mother
Not educated	4 (1.3%)	4 (1.3%)
School level	139 (46.3%)	143 (47.7%)
Tertiary	120 (40.0%)	121 (40.3%)
Postgraduate	30 (10.0%)	23 (7.7%)
Others / missing data	7 (2.3%)	9 (3.0%)

Distribution of parents' occupations

Occupations	Father	Mother
Managers	44 (14.7%)	22 (7.3%)
Professionals	66 (22.0%)	85 (28.3%)
Technicians and associate professionals	31 (10.3%)	5 (1.7%)
Clerical support workers	10 (3.3%)	20 (6.7%)
Service and sales workers	21 (7.0%)	18 (6.0%)
Skilled agricultural, forestry and fishery workers	13 (4.3%)	2 (0.7%)
Craft related trades workers	22 (7.3%)	7 (2.3%)
Plant and machine operators, and assemblers	11 (3.7%)	6 (2.0%)
Elementary occupations	15 (5.0%)	7 (2.3%)
Armed forces occupations	14 (4.7%)	3 (1.0%)
Others / missing data / never worked	53 (17.7%)	125 (41.7%)

Distribution of income

Income	Number of parents (%)
≤ RM 4850	139 (46.3%)
RM 4851 to RM 10970	107 (35.7%)
≥ RM 10971	54 (18.0%)

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Riassunto

Il calo di interesse degli studenti per i corsi di scienze, tecnologia, ingegneria e matematica (STEM) e la mancanza di laureati qualificati in tali discipline continuano a rappresentare un problema nei paesi in via di sviluppo. Un fattore importante è che gli studenti trovano le materie STEM più impegnative rispetto alle materie non STEM. Questo studio indaga specificamente la percezione delle materie STEM da parte degli studenti universitari malesi in relazione alla loro demografia e al loro status socioeconomico. L'analisi descrittiva ha mostrato che gli studenti coinvolti in questo studio hanno una percezione positiva delle materie STEM. Apprezzano lo studio di queste materie e concordano sul fatto che l'apprendimento di una materia aiuti l'apprendimento di altre materie STEM. L'analisi inferenziale ha mostrato correlazioni statisticamente significative tra etnia, dimensioni della famiglia e professioni dei padri con la percezione delle materie STEM da parte degli studenti. D'altra parte, genere, istruzione dei genitori, professioni delle madri e reddito dei genitori non sono statisticamente correlati con la percezione delle materie STEM da parte degli studenti. Sono necessari studi futuri per determinare i fattori sottostanti che contribuiscono al calo del numero di studenti nei campi STEM, nonostante la loro percezione positiva delle materie STEM.

Parole chiave: Educazione STEM; Etnica; Genere; Paesi in via di sviluppo; Sviluppo sostenibile.

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