RESEARCH AND INNOVATION IN TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING
e-ISSN: 2785-8138

RITVET

Vol. 5 No. 2 (2025) 96-101
https://publisher.uthm.edu.my/periodicals/index.php/ritvet

Factors Influencing STEM Stream Selection Among Form Four Students in Baling District from Cognitive and Psychomotor Aspects

Mohamad Nor Faizal Ibrahim[1], Rosnee Ahad[1]*, Yusmarwati Yusof[1]

[1] *Faculty of Technical and Vocational Education*
Universiti Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat, 86400, Johor, MALAYSIA

*Corresponding Author: rosnee@uthm.edu.my
DOI: https://doi.org/10.30880/ritvet.2025.05.02.012

Article Info

Received: 17 February 2025
Accepted: 12 August 2025
Available online: 30 December 2025

Keywords

Cognitive, Psychomotor, STEM Education, Student Retention

Abstract

This study examines the relationship between cognitive and psychomotor levels of students and the factors influencing their selection of the STEM stream among Form Four students in Baling District. A decline in STEM enrolment and retention rates, particularly in rural areas, necessitates this investigation. The study employs a quantitative approach using a structured questionnaire distributed to 165 stratified random samples from a population of 274 students across nine secondary schools. The instrument was developed based on Bloom's and Simpson's Taxonomies to assess cognitive and psychomotor levels. Findings indicate that students exhibit moderate cognitive and psychomotor levels. Interest is identified as the most dominant factor influencing STEM selection, followed by family and peer influence. A significant positive correlation exists between students' cognitive and psychomotor levels with their STEM stream choices. The study provides insights for educators and policymakers to enhance STEM curriculum design to foster greater student engagement in STEM fields.

1. Introduction

Through the success of Malaysia's first national car, the Proton Saga, which was produced on July 9, 1983, the fields of Technical and Vocational Education and Training (TVET) as well as Science, Technology, Engineering, and Mathematics (STEM) began to rapidly flourish in the country. Malaysians were inspired by the nation's engineering achievements, which ignited the spirit of contributing to the country's development through engineering and the STEM stream (Irwan et al., 2019).

In response to the Malaysian government's call to develop industries in line with the advancement of the Fourth Industrial Revolution (IR 4.0), the supply of skilled workers, especially in the field of engineering, has become increasingly crucial. It is not only the engineering discipline that needs to be strengthened, but also other fields related to engineering that are equally important. These fields are integrated under the STEM pillar. This aligns with Malaysia's long-term vision to become a developed and globally competitive nation, as outlined in the Malaysian Education Development Plan 2013–2025 (PPPM 2013–2025).

Today, the STEM stream, particularly engineering, is regarded as an attractive field that promises vast career opportunities due to its role in driving technological and economic innovation (Hailmi, 2015). However, a concerning phenomenon has emerged that warrants the attention of many stakeholders. In addition to the low enrolment rates in the STEM stream, the increasing number of students who choose to switch to other streams after initially joining STEM is worrying. Furthermore, the transition of students from non-STEM streams into

STEM is extremely rare, to the extent that it can be considered almost non-existent in most schools (Bahagian Perancangan dan Penyelidikan Dasar Pendidikan, 2019).

The shortage of students participating in the STEM stream has become a critical issue that must be addressed to ensure a sustainable supply of STEM professionals for the nation's future. This study, therefore, aims to explore the issue of form four students who have spent a year in the STEM stream but eventually decided to switch to other streams. This issue must be taken seriously as it could negatively impact national development if it continues, given the vital role of the STEM stream in supporting the country's industrial growth (CEBR, 2016). This study focuses on students' participation in the STEM stream and the factors influencing their selection of the stream. Previous studies have explored the issue of declining student participation in the STEM stream and its impact on the future supply of skilled labour. One of the critical aspects to consider is the cognitive ability of students in the STEM stream. Li and Wang (2021) emphasized that students in the STEM stream require higher cognitive abilities, particularly in spatial information processing and solving complex problems. A study by Sudirman and Alghadari (2020) also underlined that cognitive elements such as attention, memory, and logical thinking skills play essential roles in the success of STEM students. The psychomotor abilities of students significantly influence their persistence in the STEM stream. Psychomotor skills refer to a student's ability to apply practical skills effectively. Isa and Preece (2020) found that students with strong psychomotor abilities tend to have greater self-confidence in practical learning. Therefore, well-equipped laboratories and the application of relevant technologies are crucial to supporting students in developing their psychomotor skills towards STEM. External factors such as interest, family influence, and peer influence also have an impact on stream selection. Interest is a primary driver that sustains student motivation in their chosen field (Che Fui, 2021). However, without family support and a positive peer environment, students tend to leave the STEM stream when faced with challenges or academic pressure (Amin, 2023).

The educational environment, including the availability of facilities, teaching approaches, and early exposure to STEM activities, also influences student success in this field. Schools with adequate infrastructure and teachers who are competent in handling practical activities can significantly enhance student retention in the STEM stream (Isa & Preece, 2020). In summary, previous studies have demonstrated a significant relationship between students' cognitive and psychomotor abilities and the factors influencing stream selection. However, most studies have primarily focused on cognitive and motivational aspects without deeply exploring the influence of psychomotor skills and student demographics, especially in rural contexts such as Baling district. Therefore, this study aims to address this research gap and provide a more accurate perspective of the current situation.

2. Methodology

This section provides a detailed explanation of the research design, population and sample, research instruments, as well as the data collection and analysis methods used in this study. This study employed a quantitative approach using a survey method through the distribution of questionnaires. This design was selected to collect large-scale data and to enable statistical analysis in identifying the relationships between the studied variables.

2.1 Population and Sample

The study population consisted of form four students enrolled in the STEM stream at nine secondary schools in the Baling district, Kedah. The sample was selected using a stratified random sampling method based on the number of students in each school. A total of 165 students participated in this study, with the selection representing the overall population in a balanced manner according to the number of male and female students.

2.2Research Instrument

The research instrument used was a questionnaire developed based on Bloom's Taxonomy cognitive domain and Simpson's Taxonomy psychomotor domain. The questionnaire consisted of four main sections:

(i) Demographic information,
(ii) Items related to cognitive level,
(iii) Items related to psychomotor level,
(iv) Items related to stream selection factors (interest, family influence, peer influence).

A five-point Likert scale was used to measure students' perceptions of each evaluated item.

2.3 Data Collection Procedure

Data were collected by distributing the questionnaires to the selected students at their respective schools with approval from the school administration. Students were clearly briefed on the purpose of the study and were asked to answer the questionnaire honestly and transparently. All respondent information was kept confidential and used solely for research purposes.

2.4 Data Analysis Method

The collected data were analysed using the Statistical Package for the Social Sciences (SPSS) version 25. Descriptive analysis, including mean and standard deviation, was used to determine students' cognitive and psychomotor levels. Subsequently, Pearson correlation analysis was conducted to examine the relationship between cognitive and psychomotor levels and the factors influencing students' stream selection. The methodology employed in this study enabled the researcher to obtain accurate and reliable data and to identify significant relationships between the studied variables within the context of Form Four students in the Baling district.

3. Results and Discussion

This section presents the results of data analysis obtained from 165 respondents concerning students' cognitive levels, psychomotor levels, and the factors influencing the selection of the STEM stream.

3.1 Respondents' Demographics

The demographic analysis of the respondents covers aspects such as gender, school name, class name, and students' aspirations to further their studies in the STEM stream. The demographic findings are presented in the form of frequencies and percentages. Detailed information regarding the respondents' demographics is provided in Table 1.

Table 1 Demographics Analysis

Demographics	Category	Frequency (f)	Percentage (%)
Gender	Male	53	32.1
	Female	112	67.9
	Total	**165**	**100**
Stream Class	STEM	165	100
	Others	0	0
	Total	**165**	**100**
Aspiration to Continue in STEM Stream	Yes	161	97.6
	No	4	2.4
Name of School	SMK Agama Baling	1	0.61
	SMK Baling	56	33.94
	SMK Syed Abu Bakar	22	13.33
	SMK Tunku Putera	15	9.09
	SMK Jerai	7	4.24
	SMK Bakai	9	5.45
	SMK Kuala Ketil	18	10.91
	SMK Tanjong Puteri	20	12.12
	Sekolah Khas Baling	17	10.30
	Total	**165**	**100**

Overall, this analysis indicates that the number of female students are more than half of male students in this study. SMK Baling recorded the highest number of respondents, while the majority of respondents expressed interest in remaining in the STEM stream. This provides an indication of the influence of demographics and students' interest in the selection of this stream.

3.2 Students' Cognitive Levels

The cognitive level, with an average mean of 3.58 and an average standard deviation of 0.889, can be classified as Moderately High. This indicates that students possess a good level of cognitive understanding, though there is potential for further improvement to a higher level. These findings suggest that respondents demonstrate

stronger analytical skills but require additional support to enhance their comprehension and evaluation of concepts

3.3 Students' Psychomotor Levels

The psychomotor level, with an average mean of 3.75 and an average standard deviation of 0.770, can be classified as Moderately High. This indicates that, in general, students possess good psychomotor skills, although there is still room for further improvement to reach a higher level.

Table 2: Summary of Overall Data Analysis

Aspect	Analysis Result
The cognitive level of Form Four students towards STEM subjects	Moderate level Mean: 3.58
The psychomotor level of Form Four students towards STEM subjects	Moderate level Mean: 3.75

3.4 Relationship Between Cognitive Level and Stream Selection Factors

This analysis indicates that interest, family, and peer factors have a significant influence on students' cognitive levels, although the relationships observed range from moderate to weak. These findings confirm these factors play an important role in influencing students' stream selection decisions.

Table 3: Relationship Between Cognitive Level and Stream Selection Factors

Factor Selection		Interest	Family	Peer
Cognitive Level	Korelasi Spearman	0.385	0.302	0.307
	Sig. (2-tailed)	<0.001	<0.001	<0.001
	N	165	165	165

3.5 Relationship Between Psychomotor Level and Stream Selection Factors

These findings indicate that although the relationship between students' psychomotor levels and the stream selection factors is weak, all correlations are statistically significant. This suggests that factors such as interest, family, and peers, to some extent, influence students' psychomotor development.

Table 4: Relationship Between Psychomotor Level and Stream Selection Factors

Factor Selection		Interest	Family	Peer
Psychomotor Level	Correlation	0.265	0.266	0.280
	Sig. (2-tailed)	<.001	<.001	<.001
	N	165	165	165

4. Conclusion

The findings of this study indicate that students' cognitive levels play a significant role in the selection of the STEM stream. The positive relationship found between cognitive levels and factors such as interest, family, and peers suggests that students with higher cognitive abilities are better equipped to understand challenging STEM concepts, make informed decisions, and demonstrate greater resilience in remaining within this stream. In this context, Bloom's Taxonomy cognitive domain particularly at the application, analysis, and evaluation levels is highly relevant, as it reflects students' ability to explore subjects in depth and connect theoretical knowledge to real-world situations. Additionally, the study found that students' psychomotor levels have a significant impact on STEM stream selection. The positive relationship between psychomotor levels and selection factors such as interest and family support indicates that students' proficiency in practical activities such as laboratory experiments and solving technical problems influences their decision to remain in the STEM stream. This is aligned with Simpson's psychomotor theory, where elements such as complex responses and adaptation highlight the importance of practical skills in ensuring student success in this field. The combination of these

findings suggests that student success in the STEM stream depends not only on intellectual (cognitive) ability but also on practical (psychomotor) competence, as well as environmental support from family and peers. Students with a balanced combination of cognitive and psychomotor skills are more likely to be resilient and motivated in facing the challenges of STEM learning.

Therefore, this study underscores the importance of a holistic educational approach that emphasises the balance between cognitive and psychomotor development. This focus allows students not only to understand and master theoretical concepts but also to effectively perform practical skills. Additionally, the influence of environmental factors indicates that families and communities should play a more active role in supporting students to choose and succeed in the STEM stream. In conclusion, this study provides insight that students' cognitive and psychomotor levels shaped by various internal and external factors are key to sustaining student engagement and success in the STEM stream. The recommendations drawn from these findings provide a foundation for improving educational strategies to better align with students' needs and future challenges, particularly in facing the Fourth Industrial Revolution. The study confirms that cognitive and psychomotor abilities significantly influence students' decisions to remain in STEM streams. To enhance STEM retention, educational institutions should implement hands-on learning approaches, improve laboratory facilities, and provide strong mentorship programs. Future research should explore additional factors such as motivation and institutional support to further understand STEM selection trends.

Acknowledgment

The author acknowledges the support from Universiti Tun Hussein Onn Malaysia and the participating schools in Baling District.

Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: **study conception and design**: *Mohamad Nor Faizal Ibrahim, Rosnee Ahad, Yusmarwati Yusof*; **data collection**: *Mohamad Nor Faizal Ibrahim, Rosnee Ahad, Yusmarwati Yusof*; **analysis and interpretation of results:** *Mohamad Nor Faizal Ibrahim, Rosnee Ahad, Yusmarwati Yusof*; **draft manuscript preparation**: *Mohamad Nor Faizal Ibrahim, Rosnee Ahad, Yusmarwati Yusof*. All authors reviewed the results and approved the final version of the manuscript.

References

Amin, A. (2023). Hubungan Persekitaran Pembelajaran dan Pencapaian Akademik Pelajar Tingkatan Enam. Jurnal Pemikir Pendidikan, 11(1), 23–35. https://doi.org/10.51200/jpp.v11i1.4278

Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., & Wittrock, M. C. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives. Longman.

Bahagian Perancangan dan Penyelidikan Dasar Pendidikan. (2019). Jumlah Pelajar Mengambil Sains,Teknologi, Kejuruteraan dan Matematik (STEM) Semakin Merosot. Kementerian Pendidikan Malaysia, BPPDP BIL.(02) 2019, Edisi Mac-April, 1–12

Bloom, B. S. (1956). Taxonomy of educational objectives: The classification of educational goals. McKay.

CEBR. (2016). Engineering and economic growth : a global view. Royal Academy of Engineering, September, 1–80. https://www.raeng.org.uk/publications/reports/engineering-and-economic-growth-a-global-view

Che Fui, W. (2021, November 21). Engineers are a special breed and should be duly recognised. New Straits Times. Berita Harian Online. https://www.nst.com.my/opinion/columnists/2021/11/748075/engineers-are-special-breed-and-should-be-duly-recognised

Irwan shafrizan (2019, September 09). Penghasilan kereta nasional bantu kembangkan industri automotif – PM. https://www.bharian.com.my/berita/nasional/2019/07/582939/penghasilan-kereta-nasional-bantu-kembangkan-industri-automotif-pm

Isa, M., & Preece, C. N. (2020). Development of Psychomotor Skill and Programme Outcome Attainment of Civil Engineering Students in Malaysia Development of Psychomotor Skill and Programme Outcome Attainment of Civil Engineering Students in Malaysia. December. https://doi.org/10.53797/ajvah.v1i2.2.2020

Li, X., & Wang, W. (2021). Exploring Spatial Cognitive Process Among STEM Students and Its Role in STEM Education. 121–145.

Pelan Pembangunan Pendidikan. (2013). Pelan Pembangunan Pendidikan Malaysia 2013-2025. Education, 27(1), 1–268. http://linkinghub.elsevier.com/retrieve/pii/S0742051X10001435

Simpson, E. J. (1972). The classification of educational objectives in the psychomotor domain. Gryphon House.
Smith, J., & Brown, K. (2018). Cognitive and psychomotor development in STEM education. Journal of Science Education Research, 12(3), 45-60.
Sudirman, S., & Alghadari, F. (2020). Bagaimana mengembangkan kemampuan spasial dalam pembelajaran matematika di sekolah?: Suatu tinjauan literatur. Journal of Instructional Mathematics, 1(2), 60-72. https://doi.org/10.37640/jim.v1i2.370