Journal of Multidisciplinary and Translational Research (JMTR)

journal homepage: https://journals.kln.ac.lk/jmtr/

Factors associated with Technology stream preferences at GCE A/L in the Western province of Sri Lanka: A Chi-square analysis

R.D.S.D. Ranasinghe[1]*, P. Dissanayake[2], B. Kavinda[3]

[1]*Department of Statistics & Computer Science, Faculty of Science, University of Kelaniya, Sri Lanka*
[2]*Department of Statistics & Computer Science, Faculty of Science, University of Kelaniya, Sri Lanka*
[3]*Department of Statistics & Computer Science, Faculty of Science, University of Kelaniya, Sri Lanka*

Abstract

The General Certificate of Education (G.C.E) Advanced level (A/L) is the final stage of general education in Sri Lanka. Bio-systems Technology and Engineering Technology are the two subject streams offered under the section of Technology in schools. School census data revealed that student enrollment in Engineering Technology is comparatively higher than in the Bio-systems Technology stream in the Western province. The main objective of the research is to investigate the factors influencing students' decisions to choose between Engineering Technology and Bio-systems Technology streams at the G.C.E. A/L in the Western province of Sri Lanka and to provide suggestions to increase student enrollment in the Technology stream. The research was conducted as descriptive research with a quantitative approach. The sampling procedure was stratified random sampling, and the main data collection instrument was questionnaires. The data collected from 340 students were analyzed using IBM SPSS statistics software. The factors associated with student enrollment into the Technology stream were investigated related to academic performance, motivational factors, and external factors such as school environment, teachers' support, parental influence, and peer influence in subject stream selection. Descriptive statistics, Chi-square tests, revealed that the factors associated with parental influence, peer pressure, teacher support, and school environment did not influence the student enrollment decision for both subject streams. However, it was identified that gender, academic performance in Ordinary Level (O/L) mathematics, and personal interest in career opportunities and hands-on learning as the primary influencing factors of subject stream choice. Based on these findings the study provides evidence-based recommendations such as conducting gender-focused campaigns, improving collaborations with Industry, organizing career awareness sessions, and investing in practical learning for educational authorities to enhance the attractiveness of the Technology stream.

Keywords: Bio-systems technology stream, engineering technology stream, student enrolment

Article info

Article history:
Received 24th June 2025
Received in revised form 25th September 2025
Accepted 10th October 2025
Available online 10th December 2025

ISSN (E-Copy): ISSN 3051-5262
ISSN (Hard copy): ISSN 3051-5602
Doi: https://doi.org/10.4038/jmtr.v10i2.93
ORCID iD: https://orcid.org/0009-0003-2682-0381
*Corresponding author:
E-mail address: sandaliranasinghe4@gmail.com
(R.D.S.D. Ranasinghe)

Introduction

Education is a form of learning where the knowledge, skills, values, beliefs, and habits of a group of people are transferred from one generation to the next through teaching, training, and research. It is one of the major growing industries of the last hundred years (Dewey, 1916). The education system plays a critical role in the efforts of any country toward achieving sustainable development by strengthening social, cultural, and historical development which leads to the production of competent graduates, professionals, and technical experts within the society (Alawattegama, 2020).

The Sri Lankan education system plays a major role in shaping the nation's future by nurturing its human capital. Additionally, it fosters personal development and self-fulfillment. Apart from that, it serves as a cornerstone for the nation's development, human capital, and personal growth. Furthermore, the Sri Lankan government provides free education from primary school to university level (Solangaarachchi & Karunathilake, 2022). By providing free education, the Sri Lankan government ensures accessibility for all. The education system in Sri Lanka is mainly categorized into four stages such as "early childhood care and education", "general education (school education)", "tertiary and university education", and "vocational and technical education" (Solangaarachchi & Karunathilake, 2022).

The early childhood care and education is designed to educate young children during their formative years. When it comes to general education, it includes the primary and secondary education systems to provide foundational knowledge and skills to students. Tertiary and university education comprises higher education that goes beyond secondary school, while vocational and technical education encourage specific professions, enhancing employability and contribution to the workforce (Solangaarachchi & Karunathilake, 2022). General Certificate of Education, Advanced Level (G.C.E. A/L) is the final stage of general education in Sri Lanka which plays a crucial role shaping student's academic and professional skills. G.C.E A/L is a two-year program which comprises grade 12 and 13. G.C.E A/L offers seven subject streams at present (Table 1).

Table 1. Advanced level subject streams offered by different sections of the schools

Sections	Stream/streams
Arts/Commerce	Arts stream Commerce stream
Science section	Biological science stream Physical science stream
Technology section	Bio-systems Technology stream Engineering Technology stream
Vocational section	Vocational stream

Source: (Ministry of Education, 2013)

The G.C.E A/L serves as a critical milestone for students in Sri Lanka, determining their academic and professional futures. Among the various subject streams offered at this stage, the Technology stream holds significant importance as it provides students with a strong foundation in technical and engineering disciplines and due to its relevance in the country's rapidly developing technological landscape. The Technology stream in the Sri Lankan education system offers students a meaningful pathway to specialize in fields such as engineering, information technology, and applied sciences and it provides students with both practical and theoretical knowledge which is relevant for careers in technology driven industries (Amarasinghe & Wijewardana , 2024).

The Technology stream was introduced to the Sri Lankan education system in the year 2013 by a circular 2013/25 and it contains the two subject streams, Engineering Technology and Bio-system Technology. According to this circular, these streams were introduced to produce a generation of students who are competent to face the changing needs of society. The main objective of the introduction is to develop these competencies in the students through advanced level technology stream (Ministry of Education, Introduction of Technology Stream for General Certificat of Education (Advanced Level), 2013).

The students in this stream are not only prepared for higher education in technical fields but also to develop critical thinking and problem-solving abilities. Bio-systems technology field is important to produce technologists in the areas of automation and technologies such as information technology and the human interface, precision agriculture, power and machinery postharvest technology, structures and environment, animal production technology, soil and water and rural development (Weerakkody, 2019). With the development of advanced agriculture and environment management technologies, there is a high demand for professionals skilled in Automation and emerging technologies, Precision agriculture, and postharvest technology (Fernando, 2020).

The graduates can also pursue careers such as agricultural engineers, precision agriculture specialists, environmental consultants, and postharvest technologists, which are critical for enhancing productivity and sustainability in the agriculture field (Weerakkody, 2019). The field of engineering technology is designed to equip students with practical knowledge and skills, who were able to expand their careers in sectors such as manufacturing, construction, and telecommunications (Pathirana, 2019). The graduates were able to find opportunities in fields such as manufacturing, construction, telecommunications, and information technology (Jayawardena & Perera, 2021). Furthermore, engineering technologists were able to fill roles such as project managers, quality control engineers, and system analysts (Perera et al., 2018).

To be eligible for admission to the Technology stream, students must pass six core subjects, including medium language, mathematics, and science, at the General Certificate of Education Ordinary Level (G.C.E. O/L), with at least three subjects having credit passes (Ministry of Education, Introduction of Technology Stream for General Certificat of Education (Advanced Level), 2013). Table 2 explains the combination of subjects in engineering technology and bio-system technology.

Table 2. The combination of subjects in engineering technology and bio-system technology

	Engineering technology	**Bio-system technology**
Category A	One subject in Science for Technology	One subject in Science for Technology
Category B	One subject in Engineering Technology	One subject in Science for Technology
Category C	One selected subject	One selected subject

Source: (Ministry of Education, 2013)

Category A, which is the Science for Technology stream, is compulsory for both engineering technology and bio-system technology candidates. Within category B, candidates can choose either engineering technology or bio-system technology based on their preference. In Category C, candidates can select their 3rd subject from a pool of 11 options, which includes English, information technology, economics, geography, commerce, accounting, arts, etc. (Ministry of Education, 2013).

Ministry of Education emphasized the importance of increasing student enrollment for Science and Technology streams by up to 40% and reducing the student enrollment to the Arts stream by 25% in 2016. Even though in 2020, about 43.2% which was the majority of students enrolled in the Arts stream, and only about 32.2% were following the Science and technology streams (Ministry of Education, 2015).

In addition to that, according to the Ministry of Education census data on student enrollment and Department of Examination data on the number of school candidates who sat for the A/L examination in the last ten years, the number of students enrolled for A/L Bio-systems Technology is comparatively lower than the enrollment for Engineering Technology stream in the Western province. (Katukurunda et al., 2018) mentioned the importance of high student enrollment in the A/L Bio-systems Technology stream. As they emphasized "In the year 2013, as a remedial measure, a very good effort was made by the country in order to progressively reduce the students' enrolment into art stream whilst uplifting students' enrolment into other streams of the senior secondary (A/L) stage of education by introducing Bio-systems Technology under the Technology stream except for art, commerce, and science stream. Thus, the massive number of students' enrolment into this stream is the most important index as aforesaid aim is considered" (p.175).

Further, policies, circulars, and guidelines were prepared by the Ministry of Education and a large amount of funds were spent to conduct awareness programs, print materials, and provide physical and human resources for schools to implement both Engineering and Bio-system Technology subject streams. In addition to that, job opportunities were made available for these two streams in the local labor market. However, past data provided evidence that the student enrollment for the Bio System Technology stream has not reached the expected levels yet when consider the student enrollment of the Engineering Technology stream in Western province.

Therefore, this research study investigated the underlying causes for low student enrollment in the Bio-systems Technology stream and provides recommendations on student enrollment to fill the enrollment capacity of the schools in the Western province. Additionally, the study also assessed the facilities available for the Engineering Technology stream and makes recommendations aimed to cultivate a generation equipped to address the challenging societal needs. This will be important to meet the demands in the labor market of Sri Lanka.

Methodology

The methodological approach of this study is quantitative, and a survey strategy was used to collect data relevant to the research objectives. The population consisted of students who are studying technology stream in grade 12 at the government schools in the Western province in 2023. Thirty (30) schools were selected for this study in the Western province using the stratified sample technique. A stratified sample is independently selecting a separate simple random sample from each population stratum (Mugo, 2002). Black (1999) also explained that the stratified sample technique can ensure that specific groups are proportionally represented in the sample. The number of schools in the Technology stream was obtained from the Colombo, Gampaha and Kalutara districts. The number of schools selected from each district was calculated using the ratio of the number of schools at the district level to the total number of schools in the province. Schools were randomly selected within each district. Once the schools were identified, the survey questionnaire was administered to the 365 students of the technology stream in those schools with informed consent (Table 3).

Table 3. Sampling Frame

District	No. of schools considered	Sample
Colombo	37	13
Gampaha	29	10
Kalutara	15	07
Total	81	30

The collected data were analysed using Statistical Package for Social Science (SPSS) version 27. Demographic questions were measured as categorical variables. Five-point Likert scale questions were measured as scale variables for analysis.

Descriptive statistics and Chi-square tests were used for the analysis of data. Correlation among the students' background information and questionnaire items were performed using Spearmen's rank order correlation.

Descriptive analysis was conducted to summarize the basic characteristics of the dataset which provided the foundation for interpreting trends and variations in the data. The Chi-square test was used to examine associations between categorical variables to determine whether significant relationships existed between demographic factors and selected responses.

This study ensured validity as the items included in the data collection instruments were relevant for the study participants who were students in the Technology subject stream. The

questionnaire was clear and easy to understand. Each item on the questionnaire has a logical link with the objective of the study. The study followed the following steps; items in the questionnaire cover all the information that needs to be measured. To ensure that the information collected was relevant, a questionnaire schedule was systematically piloted among students. Based on the pilot study, the questionnaire was modified. Reliability of the study was ensured by confirming that all the items in the instruments were well constructed, relevant, and addressed the research questions and objectives. The purpose of this research was explained to the students to obtain reliable data from the participants.

Results and Discussion

The purpose of this study was to determine the various factors that may influence students' decisions to choose between Bio-system Technology and Engineering Technology subjects in the Technology stream for their G.C.E. A/L examinations and provide evidence-based recommendations to educational authorities and institutions for enhancing the attractiveness of the Technology stream.

The gender influence on subject stream selection shows a Pearson Chi-Squared value of 97.7 with 1 degree of freedom, and the p-value is less than 0.001. This result displays a statistically significant difference in gender distribution across two subject streams. A considerable gender imbalance was highlighted with 80.6% of males in Engineering Technology and 75% of females in Bio-systems Technology. Therefore, the results display that female students are more likely to enroll in Bio-systems Technology whereas male students preferred to enroll in Engineering Technology stream.

The students were asked to indicate the G.C.E. (O/L) results of the science subject to identify the influence of G.C.E. (O/L) Science subject on subject stream selection. The performance of the students from Bio-system Technology and Engineering Technology streams in Science for G.C.E (O/L) are given in Figure 1.

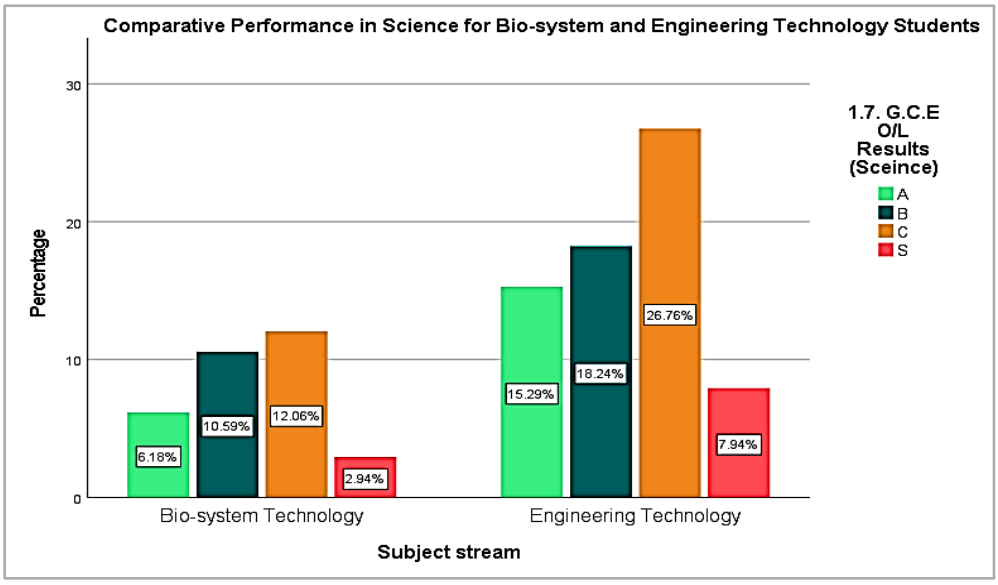

Figure 1. Performance in Science (GCE O/L) for Bio-system and Engineering Technology students

A higher percentage of Engineering Technology students obtained grades A, B, and C for Science in the G.C.E. (O/L) examination. There are about 15.3% for grade A, 18.2% for grade B, 26.8% for grade C and 7.9% for grade S. On the other hand, there is a low performance in achieving higher grades for G.C.E. (O/L) Science subject of students who enrolled for Bio-systems Technology. As a percentage A grades are 6.2%, 10.6% of B grade, 12.1% of C grade, and 2.9% of S grade were earned by the students enrolled in Bio-systems Technology indicating a stronger performance in Science among the students in the Engineering Technology stream than the students in the Bio-Systems Technology stream. However, the Pearson chi-square value of 1.83 with 3 degrees of freedom and a p-value of 0.61 which is higher than the significance level of 0.05 suggests that there is not enough evidence to reject the null hypothesis. Therefore, G.C.E. (O/L) Science results do not influence the choice of selecting the Engineering Technology stream over the Bio-systems Technology stream.

Further, based on the G.C.E. (O/L) Mathematics results among Bio-systems Technology and Engineering Technology streams, students who are enrolled in Engineering Technology show a strong performance in Mathematics subject, with higher percentages achieving grades A (22.6%) and B (25.0%), and lower percentages in grades C (15.6%) and S (5.0%). On the other hand, Bio-Systems Technology students display an even distributed performance across all grades, with percentages achieving grades A (9.7%), B (8.2%), C (7.6%), and D (6.2%) (Figure 2). Therefore, Engineering Technology students performed better in Mathematics than students who are enrolled in Bio-systems Technology.

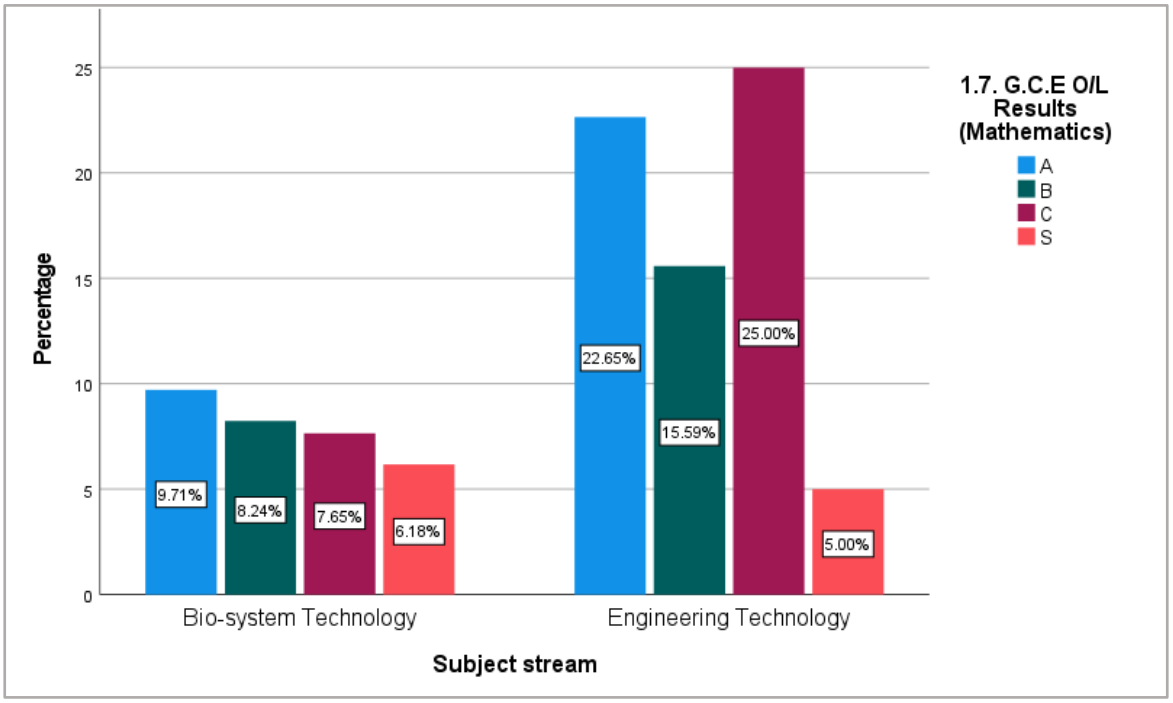

Figure 2. Performance in Mathematics for Bio-system and Engineering Technology students

Further, the Pearson chi-square value is 13.7 with 3 degrees of freedom and a p-value of 0.003. Since the p-value is below 0.05, the null hypothesis was rejected, signifying that there is a statistically significant difference between student enrollment choices based on the G.C.E. (O/L) examination results for mathematics subject. Therefore, G.C.E. (O/L) mathematics results

influenced the choice of selecting the Engineering Technology stream over the Bio-systems Technology stream.

Further, students were asked to indicate their G.C.E. (O/L) Third subject basket results to identify the impact on subject stream selection. The results highlight that most of the students currently enrolled in Engineering Technology (54.4%) chose Information & Communication Technology (ICT) at their G.C.E. (O/L) examination (Figure 3). This suggests that ICT provides strong foundational skills that align well with the requirements and interests of students in the Engineering Technology subject stream.

On the other hand, students who are enrolled in Bio-systems Technology chose Agriculture & Food Technology (17.9%) and Health & Physical Education (8.82%) at their G.C.E. O/L examination. This suggests that these integrate aspects of biological sciences, agriculture, and health, making them attractive to students with varied academic backgrounds.

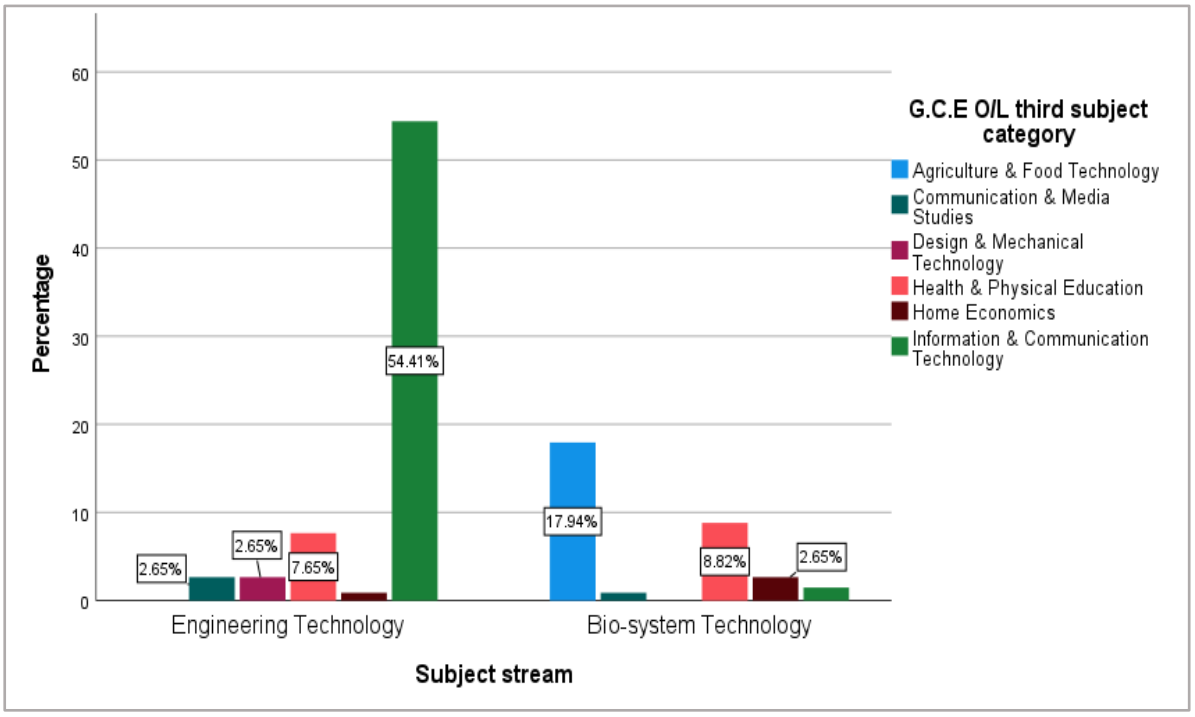

Figure 3. Influence of G.C.E. (O/L) third subject category on the selection of Technology stream subjects

A Pearson Chi-Square value of 232.5 with a p-value of less than 0.001 indicates a highly significant relationship between the choice of third subject category in G.C.E. (O/L) in significantly influencing the students to choose subject streams between Engineering Technology or Bio-systems Technology.

The students were inquired about their career aspirations after completing G.C.E. (A/L) examination in the Engineering Technology and Bio-systems Technology streams. Among the Bio-systems Technology students, 38 students aspire to become an agricultural officer, and 34 students were willing to pursue their career path as food technologists. Furthermore, 14 students showed their interest in becoming a teacher. This shows that there is a strong inclination toward careers in agriculture and biotechnology among Bio-systems Technology students. On the other

hand, 44 students expressed their interest in becoming mechanical engineers by following the Engineering Technology stream. There is an equal interest in positions such as engineers and motor mechanics (32). A considerable interest in ICT-related careers and entrepreneurship was shown among the Engineering Technology students (Figure 4).

Data highlights that there is a different career preference based on the stream of study. Most Bio-systems Technology students are interested in agricultural and biotechnological careers, though Engineering Technology students prefer engineering-related roles and modern tech-related careers. Farhan (2012), also explained that aspiration, aptitude, and career as the internal factors.

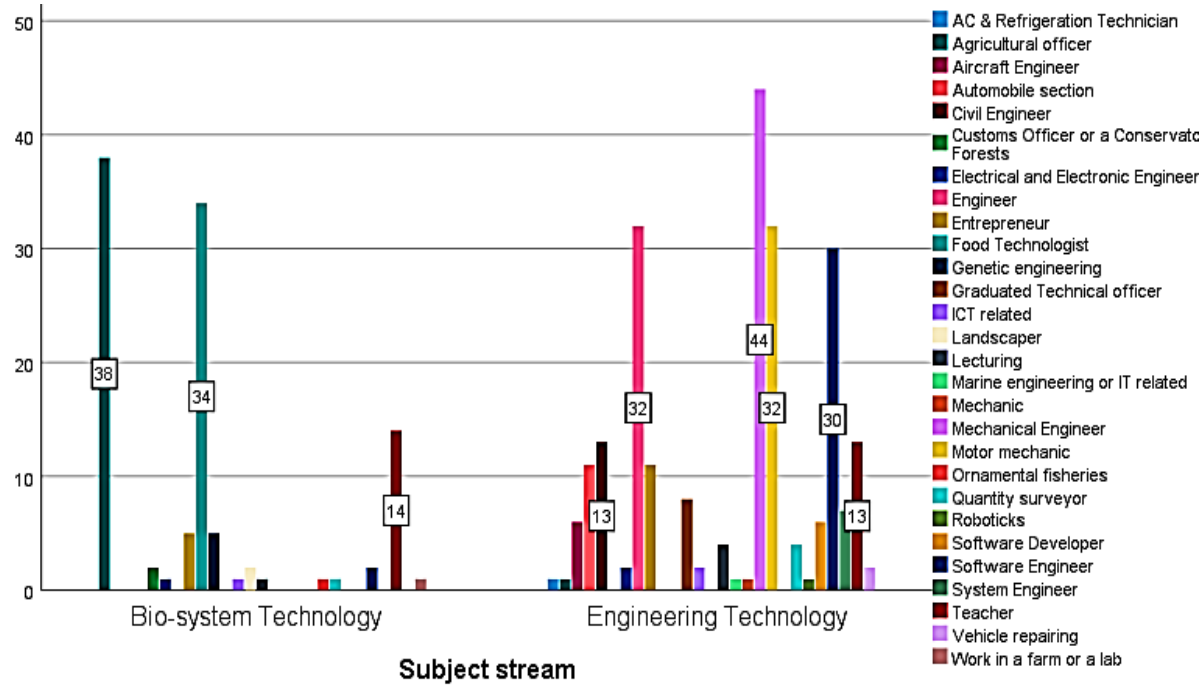

Figure 4. Career aspirations after completing Engineering/Bio-systems Technology subject streams

Students were asked to indicate whether teachers, parents, and peer groups influenced their decision to choose their subject streams for the G.C.E. A/L. The results of the Pearson chi-square test to identify the impact of teachers showed a Chi-Square value 1.88 with a p-value of 0.757, indicating that there is no statistically significant association between the teachers' influence and students' subject stream selection choice. The Chi-Square analysis validates that there is no significant relationship between teachers' influence and students' selection of subject streams in Engineering Technology and Bio-systems Technology. These results suggest that students' decisions are more influenced by a wider range of factors beyond teachers' guidance.

The Pearson chi-square test to identify the impact of parents showed a chi-square value of 4.902 and a p-value of 0.297. Therefore, even though parental influence is a factor, it does not significantly vary in guiding students toward either in Engineering Technology or Bio-systems Technology stream. However, Yawman & Appiah-Kubi (2020) mentioned that family background plays a critical role as parental education levels and socioeconomic status significantly impact the academic paths chosen by the students.

Moreover, the results of the Pearson chi-square test to identify the impact of peer group influence showed a Chi-square value is 5.534 with a p-value of 0.237. Since the p-value is higher than 0.05, the null hypothesis was not rejected. Therefore, the peer group influence does not play a significant role in a student's choice of subject stream between Engineering Technology and Bio-systems Technology.

Moreover, the study provides evidence-based recommendations to enhance the attractiveness of the Technology stream.

To attract more female students for Engineering Technology and male students for Bio-systems Technology streams, educational institutions should design campaigns that include gender-specific workshops, promoting success stories, and motivational events by inviting female engineers or male biotechnologists to address students.

To break the traditional gender distribution in career path selection, mentorship, and scholarships can be offered to female students in engineering and male students in biotechnology fields.

To provide students a proper guidance on their stream selection, schools should conduct teacher guidance programs where teachers act as academic and career advisors. Providing such kind of guidance will support students to achieve their career aspirations.

Teachers should have a trained mindset to offer emotional support and encouragement together with academic advice. Which means that a positive teacher-student relationship will improve the confidence level of the students in their abilities and motivation to take decisions to follow challenging subjects like Engineering or Bio-systems Technology.

To build peer relationships and to gain benefits and learning experiences, it's better to encourage students from both Engineering Technology and Bio-systems Technology streams to collaborate on interdisciplinary projects. This will also help students to learn new opportunities which will support them in their subject stream selection decisions.

Schools can organize cross-stream learning opportunities to engage students with one another and share their knowledge. Additionally, schools can conduct innovation exhibitions to support students in gaining cross-stream knowledge which will be beneficial for the competitive world.

Based on the forecasting results, most of the students are likely to choose Engineering Technology stream. Schools can offer them specialized courses or opportunities to gain practical knowledge, which will be beneficial for their future careers. Providing such resources and opportunities will be a positive step in attracting more students interested in the technology field.

Since the growth of the Bio-systems Technology stream is slower, schools can conduct extra sessions, courses, presentations, quizzes and activities on topics such as **biotechnology**,

sustainable agriculture, or **environmental science**. These types of innovative activities can influence students and boost the confidence of those who have doubts on choosing this field.

Government and educational authorities should allocate resources based on the forecasted trends. Districts with higher forecasted enrolments should receive more investment in infrastructure, teachers, and materials to fulfil the growing student population in both Engineering and Bio-systems Technology streams. Districts with declining forecasts should focus on conducting programs to encourage students to select Technology stream.

Conclusions

The study revealed a significant change in students' decision-making from the influence of external factors such as parental, teacher, peer, and school factors towards an independent decision-making approach. Therefore, this study suggests that the students are becoming more self-directed in their educational pathways over conventional external influences.

Conflict of interest statement:

The authors declare no conflict of interest.

References

Alawattegama, K. K. (2020). Free Education Policy and its Emerging Challenges in Sri Lanka. *European Journal of Educational Sciences, 7* (1), 1857- 6036.

Amarasinghe, A., & Wijewardana , Y. (2024). Studying the Influence of Technology Stream on the Sri Lankan Education System: A Case Study of Technology Stream Graduates in Sri Lankan Universities . *Journal of Research Technology & Engineering , 5* (1), 57-68.

Black, T. R. (1999). *Doing quantitative research in the social sciences: An integrated approach to research design, measurement, and statistics.* Thousand Oaks, CA: SAGE Publications, Inc.

Dewey, J. (1916). Democracy and Education. Glencoe, IL: The Free Press.

Farhan, M. (2012). Factors Influencing Students' Enrollment Decisions.

Fernando, M. (2020). Advances in Postharvest Technology in Sri Lanka: A Review. *Tropical Agricultural Research, 32* (1), 45-59.

Jayawardena, R., & Perera, S. (2021). Educational Reforms in Engineering Technology: A Sri Lankan Perspective. *International Journal of Engineering Education, 28* (3), 233-245.

Katukurunda, K., Yajid, M. S., Khatibi, A., & Azam, S. (2018). Students' Satisfaction Towards Biosystems Technology: Does Programme Quality Matters? (Evidence From Sri Lankan Perspectives . *European Journal of Open Education and E-learning Studies, 3* (2).

Ministry of Education. (2013). *Introduction of Technology Stream for General Certificat of Education (Advanced Level).* Ministry of Education.

Ministry of Education. (2015). *School Census Report.*

Mugo, F. W. (2002). *Sampling In Research.* Retrieved September 23, 2017, from https://profiles.uonbi.ac.ke/fridah_mugo/publications/sampling-research

National Institute of Education. (2019). *Subject steam selection of General Certificate of Education (A/L) courses in Sri Lanka.* Department of Research and Development, National Institute of Education.

Pathirana, D. (2019). The Role of Engineering Technologists in Sri Lankan Industry. *Industrial Engineering Review, 12* (2), 123-134.

Perera, G., Wijeratne, W., & De Silva, H. (2018). Employability of Engineering Technologists: A Sri Lankan Perspective. *Sri Lankan Journal of Employment and Technology, 3* (1), 23-37.

Solangaarachchi , T., & Karunathilake, K. (2022). A Review on Education and Performance of Education in Sri Lanka. *American Research Journal of Humanities & Social Science (ARJHSS), 5* (4), 12-21.

Weerakkody, W. (2019). ICT in Agriculture: Opportunities for Enhancing Agricultural Productivity in Sri Lanka. *International Journal of Agricultural Management, 7* (4), 215-229.

Yawman, M., & Appiah-Kubi, J. (2020). Impact of Family Background on Academic Achievement and Adjustment Difficulties. *International Journal of Current Research*.