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FACTORS THAT IMPACT THE SELECTION OF BIO SCIENCE STREAM IN THE G.C.E ADVANCED LEVEL IN THE WESTERN PROVINCE, SRI LANKA

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ABSTRACT

The choice of stream in upper secondary education is a turning point for every student for a successful career in the future. The education system in Sri Lanka has five streams—Biological Science, Physical Science, Commerce, Arts, and Technology—and the Biological Science stream is important in national development. The students who select the Biological Science stream in upper secondary education are influenced by several factors, showing a declining trend in Western Province, Sri Lanka. Accordingly, this research aims to identify the factors affecting the selection of the Biological Science stream in G.C.E Advanced Level (G.C.E A/L) in the said region and to examine the impact of those factors. The study identified self-efficacy, career opportunities, and normative social influence as the factors impacting the selection of the Biological Science stream. Data for this study were collected using a mixed method: Primary data was collected using structured interviews and a questionnaire survey. Twenty students were interviewed using convenience sampling, and a questionnaire survey was conducted on a sample of 370 students using a simple random sampling technique. Data were analysed using thematic and multiple regression analysis. According to the regression model, the study recognized that career opportunities and self-efficacy are the most significant factors which impact the selection of the Biological Science stream. The findings suggest improving the quality of the Biological Science curriculum in the G.C.E A/L examination and encouraging students to continue their studies in the Biological Science field, thereby further contributing to national development. This research provides information to stakeholders such as students, parents, educators, and the government for making different policy decisions.

Key Words: Advanced Level, Bio Science Stream, Selection of Stream, Western Province

1. Introduction

Every single person believes that education is a priority in the era of globalization and technology. It is a tool for survival that improves students' rationality, intelligence and virtues (Lamichhane, 2018). The General Certificate of Education Advanced Level (G.C.E A/L) examination plays an important role in determining a student's future. Once a student completes the G.C.E Ordinary Level examination (G.C.E O/L), he/she shall select among Bio Science, Physical Science, Commerce, Arts, and Technology streams, which are the most common choices provided in the Advanced Level. Bio Science stream is considered as a valuable stream as it inspires inventions, increases productivity, competitive advantages of corporations that develops the economy of nation (Malik et al., 2021; Awosika, 2008).

Table 1: Composition of A/L Students in Government Schools Selected Bio Science Stream in the Western Province from 2018 to 2020

Year	Bio Science Stream	
	Frequency	Percentage
2018	16,188	11.55%
2019	10,492	10.18%
2020	9,784	9.28%

Source: Ministry of Education (2018); Ministry of Education Sri Lanka (2019); Ministry of Education (2022)

According to Table 1 above, a decline can be observed in the number of students in the Western Province who chose the Bio Science stream for their A/L between the years of 2018 and 2020. In the year 2018, 11.55% of students chose the Bio Science stream; in the following years, this percentage decreased to 10.18% and 9.28% in the year 2019 and 2020, respectively. According to data of the Ministry of Health (MoH) Sri Lanka, in 2016, there were only 72,729 health workers in the nation. However, because the Sustainable Development Goals (SDG) index is predicted to be 4.45, which estimates a minimum of 91,000 health workers, the country faces a shortfall of about 18,271 health workers. This is related to the issue over the social effect given that fewer students are choosing the bioscience stream while the need for health workers in the nation is growing, thus the gap is widening. Researchers of this study identified the empirical gap to investigate the problem and devise appropriate solutions. Hence, the researchers developed objectives for the study as follows,

1. To identify the factors for the selection of Bio Science stream in the G.C.E Advanced Level in the Western Province, Sri Lanka.
2. To examine the impact of factors on the selection of Bio Science stream in the G.C.E Advanced Level in the Western Province, Sri Lanka.

Existing research studies have paid attention on several factors that determine the Bio Science stream selection in many developing countries. A few Sri Lankan contexts such as the research study by Vinthuja et al. (2014) discussed the factors influencing in the choice of A/L stream in the Jaffna district. Another similar study was conducted by Gayathiri and Selvarajah (2009) focusing the same issue in the Batticaloa District. However, evidence focusing on the Western Province, is lacking. Therefore, this research study concentrates on investigating factors that impact the selection of Bio Science stream in the G.C.E A/L in the Western Province, Sri Lanka.

2. Literature Review

The decision of students in selecting their study stream in the Advanced Level is influenced by various factors. Abeygunawardena (2018) identified that many studies have been conducted globally to explore the numerous factors influencing students while selecting various disciplines. According to Philipp (2019), challenges with secondary education need to be addressed. Thus, every education system of countries focusses on the secondary education policies for national development.

Malik et al. (2021) acknowledged the importance of studying Science. In addition, this study found attitude towards science, normative social influence, and self-efficacy had significant relationship with the intention of students selecting Bio Science. Factors such as personal, academic quality, job related reasons are influencing the choice of study specialization (Perera and Pratheesh, 2018). Kinyota (2013) identified factors as examination scores, self-efficacy in Science, knowledge of available careers, gender and school resource contexts affect students' choice in the Science stream in Tanzania. The study conducted by Gayathiri and Selvarajah (2009) recognized the factors affecting the selection of Bio Science stream in the Batticaloa District, Sri Lanka. The findings of the study revealed the impact of family education index is significant and female students selecting the Bio Science stream shows an increasing rate. Studies carried out by Kalyani and Chathuranga (2021) discovered that students decide their profession based on aspirations and career opportunities while choosing their A/L streams with the concern of their self-efficacy being affected by normative social influence.

Students who believe in their self-abilities are strongly determined and achieve their goals (Hussain and Khan, 2022). Alqurashi (2016) proved self-efficacy has a significant impact on student satisfaction and intention on choosing future studies. Research study by Domenech-betoret, Abellan-rosello and Gomez-artiga (2017) emphasized how self-efficacy influences secondary education and academic achievement of students. The researchers of this study found personal characteristics such as interest and aptitude in the field, personal image, personality, mental capacity, student needs, ambitions, and motivation affect the decision making of subject stream. The idea of educational decision-making is intertwined with that of career decision-making. Socioeconomic status is defined as their position in society based on their income, power, occupation, education, and prestige (Jabeen, 2015). Downey, Mcgaughey and Roach (2011) conducted a study to investigate the factors recognized in choosing a subject field. Findings concluded that career availability and job security are considered important. Based on the findings of Rose and Baird (2013), students were concerned

about future career opportunities as they were keen on linking their educational decisions with future career options. Studies also conducted to analyze the factors associated with normative social influence on the decision-making process of students. Parents, teachers, and friends could frequently encourage or influence students to seek specific major of their choice of study stream (Hoai, Thi, and Thanh, 2016; Shumba and Naong, 2012; Zare-ee and Shekarey, 2010). Students are more likely to discuss with and be affected by their classmates while choosing big educational decisions (Hussin, Muhamad, and Khalil, 2019). Comparatively, high background family influences to choose Science streams than low background families (Maltese and Tai, 2011). Chandrakumara (2010) investigated about the human capital formation within families, in terms of family wealth, and children's education. Another study by Vinthuja et al. (2014) stated that financial support is one of the most influential factors in the Northern province, Sri Lanka. The study by Arshi (2020) stressed about the characteristics of subject stream, where students are concerned about the broad syllabus, complex nature, and pressure of studying science streams. Gender is identified as an influencing factor in subject selections, as analyzed by Tripney et al. (2010).

3. Methodology

The researchers used mixed research method to obtain the holistic picture of the study, since it connects the advantages of both qualitative and quantitative study. Structured interviews were used to collect the qualitative data to identify the influencing factors and questionnaires were used to collect the quantitative data to examine the impact of those factors on the selection of Bio Science stream in the G.C.E Advanced Level in Western Province, Sri Lanka. The interviews were conducted through phone conversations, zoom meetings and Google forms were utilized for questionnaires. Throughout the full process of data collection, all the necessary steps were taken by the researchers to maintain participants' confidentiality and convenience.

The structured interviews and questionnaire were aligned with the objectives of the study. Both the structured interviews and questionnaire had close-ended and open-ended questions, in addition, to measure the variables, the questionnaire used by Kinyota (2013), which includes 34 questions directed on a five-point Likert scale, categorized into three factorial and nine dimensional components, was adopted. The researchers selected the students of the 2020 G.C.E A/L batch who choose the Bio Science stream within the government schools in the Western Province, Sri Lanka as the population of the study. Statistics Branch of the Ministry of Education (2022) revealed that the total population for this study is 9,784 Bio Science students in the Western Province. To select participants for data collection, convenience sampling was applied under non-probability sampling technique for the structured interviews and simple random sampling under probability sampling technique was used to share the questionnaire. A sample size of 20 responses were selected after reaching the saturation point from the interviews conducted (Vasileiou et al., 2018). The study also used the Morgans table (Krejcie & Morgan, 1991) and accordingly, determined the sample size of 370 students for the questionnaire.

In this study, a thematic analysis was used to identify the factors influencing the selection of Bio Science stream, where the researchers transcribed the responses and generated codes and themes to identify the factors. Multiple regression analysis was carried out/performed on the data collected from the questionnaire to examine the impact of factors on the selection of Bio Science stream. The model was estimated, and analysis was done to test the hypotheses of the study. Statistical Package for Social Sciences (SPSS) Version 26.0 was deployed to analyse data for this study.

Based on the results of the interview responses, the conceptual framework of the current study was constructed. The model comprised of three major independent variables such as self-efficacy, career opportunities and normative social influence including the three dimensions (independent variables) and the dependent variable, as shown in Figure 1 below.

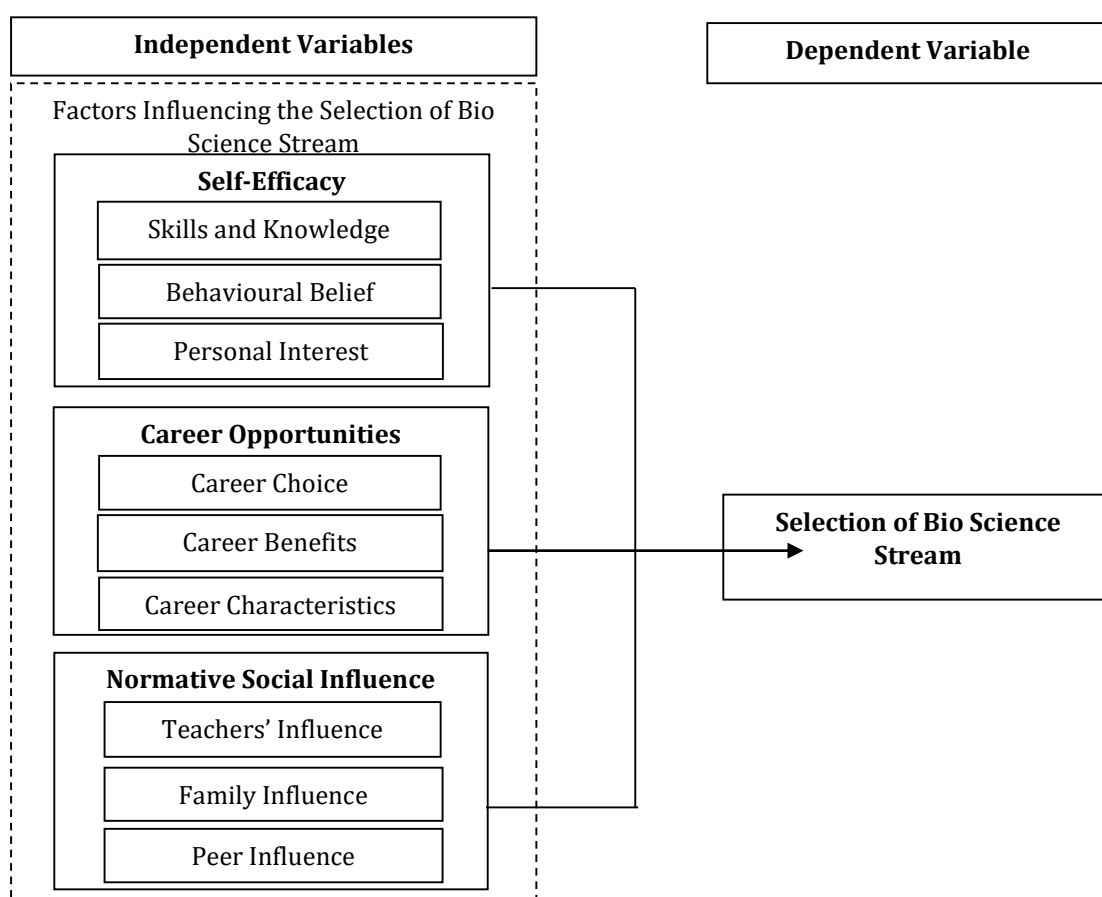


Figure 1. Conceptual Framework

Source: Authors' Compilation (2022)

4. Results and Discussion

4.1. Results

This study was conducted to identify the factors for the selection of Bio Science stream and to examine the impact of those factors.

Objective 1: To identify the factors for the selection of Bio Science stream in the G.C.E Advanced Level in Western Province, Sri Lanka.

The thematic analysis was conducted on the responses collected from the structured interviews. The researchers identified self-efficacy, career opportunities, normative social influence, financial support, characteristics of the subject stream and gender as the factors affecting students when selecting the Bio Science stream in the said region consisting of Colombo, Kalutara, and Gampaha Districts. Table 2 shows the codes and themes generated from the responses.

Table 2: Codes and Themes Generated from the Responses

Codes	Themes
Skills and knowledge enhancement Behavioural belief Personal interest	Self-efficacy
Career choice Career benefits Career characteristics	Career opportunities
Teacher's influence Family influence Peer influence	Normative social influence
Ability to pay fees Financial status	Financial support
Subject content Subject variety Time period	Characteristics of the subject stream
Women in the medical field	Gender

Source: Constructed by Authors Based on the Thematic Analysis (2022)

The interviewee details depict the personal characteristics of the respondents participated in the thematic analysis. In total, 20 students were interviewed, out of which, 14 were female and 6 were male. Further, 7 students were from the Sinhala medium, 7 students were from the Tamil medium and the remaining 6 were from the English medium. Thirteen participants were from the Colombo District, four participants were from the Kalutara District and three participants are representing the Gampaha District. The majority of the students pointed out self-efficacy, career opportunities and normative social influence as the factors that affected their decision making and a very few cited financial supports, characteristics of the subject and gender as the factors affected their selection decision in the Western Province Sri Lanka (Appendix 1).

Objective 2: To examine the impact of factors on the selection of Bio Science stream in the G.C.E Advanced Level in Western Province, Sri Lanka.

The questionnaire was equally distributed in Colombo, Kalutara, and Gampaha Districts of the Western Province. Among the participants, 54% were male and 46 % were female. Based on the multiple regression analysis the hypotheses were tested. It was identified that career opportunity had a stronger impact while self-efficacy had a mid-level impact and normative social influence had the least impact on the student selection in the Bio Science stream. Based on the coefficients shown in Table 3 below, the coefficient value of career opportunity was 64% with a significance of 0.000, the coefficient value of self-efficacy was 32% with a significance of 0.000, and the coefficient value of normative social influence was 8% with a significance of 0.028.

Table 3: Coefficients

Model	Unstandardized Coefficients		Sig
	B	Std. Error	
Career opportunities	0.640	0.032	0.000
Self-efficacy	0.323	0.041	0.000
Normative social influence	0.085	0.039	0.028

Source: SPSS Coefficients Output (2022)

Hypotheses testing revealed that self-efficacy and career opportunities have a significant impact on student's decision in selecting the Bio Science stream. The significance value was less than 0.001 and therefore, the alternative hypothesis was accepted. In contrast, normative social influence does not have a significant impact on student's decision in selecting the Bio Science stream. This is because the significance value was more than 0.001 and accordingly, the alternative hypothesis was rejected as depicted in the Table 4 below.

Table 4: Hypothesis Testing

Hypothesis	Significant value	Accepted/ Rejected
H1 ₁ - Self-efficacy has a significant impact on students' decision in selecting Bio Science stream.	0.000	Accepted
H2 ₁ - Career opportunities have a significant impact on students' decision in selecting Bio Science stream.	0.000	Accepted
H3 ₁ - Normative social influence has a significant impact on students' decision in selecting Bio Science stream.	0.028	Rejected

Source: Constructed by Authors Based on the Multiple Regression Analysis (2022)

According to the analysis, it was concluded that career opportunities and self-efficacy do impact while normative social influence does not impact on students in terms of selecting the Bio Science stream in the said region.

4.2. Discussion

The study presented empirical findings on the influence of factors towards the Bio Science stream selection in the Western Province, Sri Lanka by conducting the thematic and multiple regression analyses. The basic dimensions of each independent variable are presented in Table 2. According to the thematic analysis performed by transcribing each of the responses collected from the structured interviews in Appendix 1, the study recognized self-efficacy, career opportunities, and normative social influence are mostly claimed as key factors influencing the choice of Bio Science stream. Therefore, the results revealed that these three variables were acceptable and can be employed to construct the conceptual framework in this study (Figure 1). Similarly, the positive significance of impact was found in the existing studies (Kalyani and Chathuranga, 2021; Malik et al., 2021; and Hussain and Khan, 2022).

Considering the three independent variables, the information presented in Table 3 indicates that the majority of the students have determined their future career path to be related to the Bio Science field. The findings of past researchers support the fact that career opportunities highly impact the choice of Bio Science stream (Kalyani and Chathuranga, 2021; Jabeen, 2015)., In addition, the impact of self-efficacy in Bio Science stream selection is statistically significant, meaning it makes a significant contribution. This finding is similar to the study by Malik et al. (2021) which revealed the positive relationship of self-efficacy with students' intention to study Science stream. Kinyota (2013) too confirmed this finding. Correspondingly, the positive coefficients of career opportunities and self-efficacy in Table 3 indicated that one percentage improvement in each independent variable would lead to 0.64% and 0.32% in career opportunities and self-efficacy, respectively in the overall Bio Science stream selection. This is because there is a significant positive impact between predicting and outcome variables.

Furthermore, the result of the present study explains that normative social influence has a positive impact whereas one percentage improvement of the variable which leads to 0.08% increase in the overall Bio Science stream selection. The study carried out by Malik et al. (2021) found normative social influence has the most significant positive relationship with studying intention of Science stream. However, the particular study was limited only to a few rural area school in Malaysia; On the contrary, the present study reflects a distinctive view about the entire Western Province in Sri Lanka. Here, it has been identified that normative social influence does not significantly impact on the Bio Science stream selection. Results further prove that Bio Science students are not highly affected by the influence of their parents, friends, or teachers. The studies by Hussin, Muhamad, and Khalil, (2019) and Maltese and Tai, (2011) were contradictory to the most findings of normative social influence. However, their results reflected only the students from high background families related to Science field. To conclude, the findings of the current study represent the general opinion as well as some unique findings pertaining to Bio Science students in the Western Province, Sri Lanka.

5. Conclusion and Recommendations

5.1. Conclusion

Previous studies analyzed various factors according to different geographical, social, and personal perceptions and provided empirical evidence. It is notable that literature is lacking in these subject areas in the Sri Lankan context. Based on the structured interview responses, self-efficacy, career opportunities, and normative social influence have been identified as the factors that impact the most. As per the multiple regression analysis results, it has been found that career opportunities and self-efficacy significantly impact the selection of Bio Science stream. Apart from this, normative social influence does not have a significant impact on students' decision in selecting the Bio Science stream. In addition to that, the findings of the results further affirm that, future career opportunities have a major influence on selecting the Bio Science stream in the G.C.E A/L in the Western Province, Sri Lanka.

5.2. Implications and Recommendations

The outcomes of the present study minimize the research gap and can be used as reference for future researchers to undertake further studies.

Moreover, the findings of the study have substantial implications for students, schools, and government, as studying Bio Science stream is valuable for national development. The study indicates the importance of Bio Science stream, where students are encouraged to pursue future aspirations related to Bio Science streams, schools to improve better administration and academic strategies to provide proper guidance, and government to redesign an up-to-date syllabus that enriches quality of learning experience to promote the subject stream, which can lead to produce superlative expertise professionals in future.

The current study was conducted to promote students to choose the Bio Science stream that has much potential to improve economic growth. Fulfilling the health labour sector requirements in Sri Lanka is one of the benefits of doing so. As per the study outcomes, it can be recommended that students gain sound knowledge about future opportunities to set realistic goals and work towards these goals. In this sense, career guidance and counselling programs are suggested for effective decision making. In addition, parents, teachers as well as schools have a key role to play, in assisting students to identify the future career prospects before selecting the A/L study stream. Researchers suggest a well improved educational curriculum of Bio Science education to be developed. Moreover, the researchers recommend future researchers to conduct studies to emphasize the students' reasons for not selecting the Bio Science stream due to the declining trend in students selecting Bio Science stream in the G.C.E A/L.

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Appendix 1

Interview Responses

Res pon den t	Responses	Code
01	“I selected the Bio Science stream because my ambition was to become a doctor or a pharmacist which led me to select the Bio Science stream. And, for me as a person I loved Bio Science as a subject because I liked the content in the subjects that were taught which made me select the Bio Science stream.”	Behavioural belief Personal interest Subject content
02	“My mother is a doctor . I have the dream of becoming like her. So, I wanted to study Bio Science Stream and also my family was able to pay my fees , so I selected the Bio Science stream.”	Family influence Behavioural belief Ability to pay fees
03	“I am a biology lover . it's totally my decision for why I selected bio stream. So, considering my knowledge, talent, and my O/L results I selected this stream.”	Personal interest Skills and knowledge enhancement
04	“So why I chose Bio stream was cause both my parents are doctors which from childhood they inspired me to become a doctor. Also, I like the Biomedical field and the subject. Also, I believed in me that I can do this subject.”	Family influence Personal interest Behavioural belief
05	“Basically, from primary school I used to love science and was confident about studying science. And there was nothing to worry about the career opportunity because there are several career choices when you come to science.”	Personal interest Behavioural belief Career choices
06	“Since my childhood I have had a dream of becoming a doctor. ”	Behavioural belief
07	“ I was interested in doing Science, currently my sister is a Biomedical engineer which influenced me to take the Bio Science stream.”	Personal interest Family influence

08	“There will be more opportunities with higher salaries , my parents wanted me to study Bio Science.”	Career benefits
09	“Studying science will be helpful to enter university and get a good job . Because one of my teachers said that there were many courses available for science students at universities. Also, my elder sister did the same stream so I thought that I can get immediate help and support from her.”	Career benefits Teachers’ influence Family influence
10	“ I wanted to do Biomedical engineering and also when it comes to the medical field it was the men dominating so as a woman I wanted to get into the field of medicine . And another factor would be the subject baskets it was something that I was interested in, so I selected Bio Science stream.”	Career choices Women in the medical field Subject variety
11	“First, I was very confident to choose the Bio Science stream as my A/L stream second biology jobs offer high salary, job ability and as well as other than the doctors. I can choose various Biology specializations as well . Example molecular, human, plant and even environmental science.”	Behavioural belief Career benefits Career characteristics Subject variety
12	“Honestly, I was brainwashed from my childhood that if I want to be successful, I’ve to take science. So thereafter considering my capability to do Biology rather than Mathematics, I rejected physical science and chose Bio Science.”	Family influence Skills and knowledge enhancement
13	“After finishing my ordinary level, I did research based on future career choices and salary . Also, I consider the subjects which interested me during my ordinary level. So, surgeons have good career opportunities , and I was curious about learning biology at my ordinary level, so I selected Bio stream.”	Career choices Career benefits Personal interest
14	“First and foremost, the love towards biology and especially the white coat attracted me to do Bio stream . Other than that, the variety of job opportunities and the impact of science in my skills motivated me further .”	Personal interest Career choices Skills and knowledge enhancement

15	“The main factor is my friends. Many of my friends have taken Bio stream so literally I also gone with the same stream. And I believed in myself that I can do this stream and get good results. Further Financial position of my family was also influenced.”	Peer influence Behavioural belief Ability to pay fees
16	“After getting a good result at my Ordinary Level I had an ambition to be a doctor . Since my financial support was there, I chose Bio Science for my Advance Level.”	Behavioural belief Ability to pay fees
17	“ I believe that I can do this study and my father is also from the Bio Science background so there seems to be more opportunities in that field. ”	Behavioural belief Family influence
18	“When I chose my stream, I looked into many things for me financial status was not good so I had to consider that before I confirmed with going into Bio Science, and also checked on the subjects that was provided , how the baskets were and whether it was going to be a subject that will match my skills and preferences I want.”	Financial status Subject variety Skills and knowledge enhancement
19	“Number one is I was confident about myself , and my father was able to pay my class fees , so they are the factors which mainly I considered when selecting Bio Science stream.”	Behavioural belief Ability to pay fees
20	“Opportunities I had if I selected the Bio Science stream because financially my family was able to go abroad and do my studies or even start my higher education. So, I felt there were more career opportunities there and there were more openings in the science field . When it comes to Bio Science stream the time period that it takes was also considered and it was something expected by my parents .”	Financial status Career choices Career benefits Time period Family influence

Source: Constructed by Authors Based on the Interviews (2022)