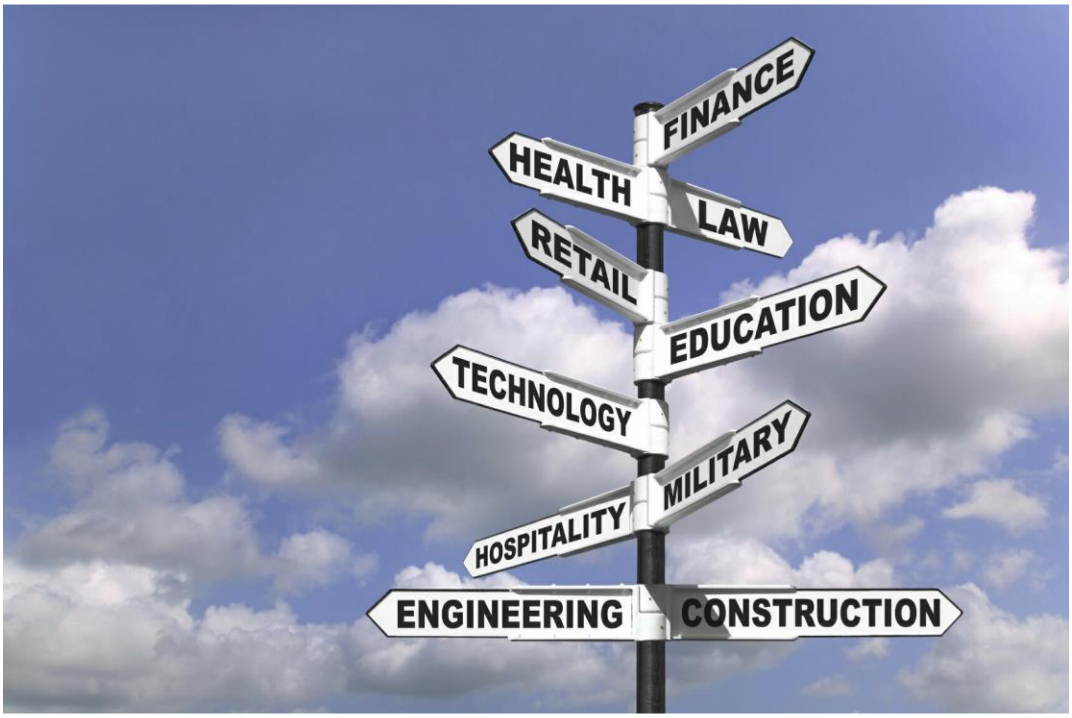

Factors influencing whether students choose STEM high school programs

A quantitative study of a selection of factors

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Abstract

In this study, several factors that may influence a student's choice of pursuing a STEM high school program was studied. The factors studied are some of those identified and studied in previous research in this field. A survey was conducted with students in grade 9 in five different schools. The data collected was analysed and statistical methods were applied to find possible correlations and effect sizes. The results showed that parental educational background could not be shown to have a statistically significant effect. Self-efficacy was found to be the strongest influence in terms of difference in means and effect size. Other factors that were studied and found to be significant were gender, interest in STEM subjects in school as well as other STEM topics, attitude towards STEM education and science & technology in society and lastly a student's future desired profession.

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Contents

Chapter 1

Introduction

1.1 Background

Every year yet another cohort of adolescents finish their ninth year of elementary school which is obligatory by law in Sweden. A prerequisite to establish oneself on the labor market however is to continue one's studies, meaning pursuing a high-school education and even higher education after that. This not only benefits the individual but is also beneficial for all of society to continue to thrive and develop as a modern, democratic nation that is competitive in the global market. It is also important that a significant proportion of adolescents pursue a STEM career since we live in an advanced society where technological and scientific development is essential, as is producing professionals such as doctors and engineers. To achieve this, it is important that enough adolescents pursue a STEM education.

The school year 2021/22, about 132000 students applied for one of the nation's high school programs. About 20% of them applied to either the science or technical program which are the two main STEM programs available. Of all the applicants to a STEM program 95% were qualified (Skolverket, 2022).

The number of applicants is however not the only factor, but also the competence of those who apply. To be able to succeed in a STEM program it is beneficial if the student has a high level of prerequisite understanding of the STEM subjects and a strong drive to pursue a post high school STEM education since this is most often a requirement for such a career. A higher education in STEM also demands competence in these subjects.

Many of the higher educational STEM programs do not have enough applicants and are not filled to capacity. In addition to this many of those who enroll in these programs do not finish and graduate. Of those that enroll in an engineering program about half graduate. (Sveriges Ingenjörer, 2022).

1.2 Aim

What affects students' choice of education has been studied diligently in Sweden as well as internationally. A multitude of variables have been identified, for example parental educational background, science capital, interest, future ambitions, identity, attitude about STEM and professionals in STEM, self-efficacy in STEM subjects, and teachers' influence.[1]

Insight into what affects whether a student pursues a STEM education can aid STEM teachers to develop their teaching to better motivate and inspire students to pursuing such an education in high school and later in life. It can also aid politicians and policy makers when shaping the school system and society in a way that increases the interest in and pursuit of STEM. This could lead to society generating more engineers, doctors and other scientists.

This study has examined if a number of different factors previously identified do in fact affect or at least correlate with ninth graders' choice of high school program. A multitude of factors have been studied. These are: gender, parental educational background, interest in STEM, self-efficacy, ambition of future professions and desired work tasks as well as valuation of quality of work life.

1.2.1 Research question and hypotheses

What factors, out of a selection of previously identified factors, correlate with choosing or not choosing a STEM program in high school?

Hypotheses, based on previous research

- There is a discrepancy between genders when pursuing STEM education.
- The educational background of parents affect the student's pursuit of a STEM education, where the children of higher educated parents, especially those educated within a STEM field, are more likely to pursue STEM education.

[1]see further discussion of these factors in section 2.2.

- A higher interest in STEM subjects, inside and outside of school STEM subjects, drives students to pursue a STEM education.
- A stronger confidence in the student's self-perceived ability in STEM subjects drives students to pursue a STEM education.
- Those with a more positive attitude to science and technology development in society are more likely to pursue a STEM education.
- Those 15 year old students who already aspire towards a STEM profession will pursue a STEM program as early as high school.

Chapter 2

Theory and previous research

Many previous studies have been conducted with the aim to study what factors affect students' choice of educational pursuits. Models that describe motivation and behaviour have been developed to explain the differences in pursuits. Some of the most relevant of these studies for this thesis as well as a commonly used model of motivation are presented here.

2.1 Motivation in expectancy-value theory

Two researchers in developmental psychology has developed the Expectancy-Value Theory (Wigfield & Eccles, 2000). In this model, Wigfield and Eccles posit that an individual's motivation to pursue a task is affected by the expectancy to succeed (self-efficacy) and by the value the individual places on succeeding on that task. The model has been developed in the context of educational performance and an individual's motivation to commit to tasks. This model is used in the analysis along with previous research as a basis for explaining the results on established theory.

An individual's self-efficacy can be influenced by past experiences, feedback, social comparison, and other task-specific factors. With a higher expectancy to succeed an individual will put in more effort and be more likely to persist in attaining success and perform better. They are also more likely to attempt more challenging tasks.

An individuals' subjective task value is comprised of four factors; intrinsic interest (enjoyment attained from performing the activity), attainment value (importance of performing well on the task), utility value (usefulness of the task to attain future goals) and cost (sacrifices for engaging in the activity).

2.2 Previous research

Data on applications to high schools show that only 8% of those applying for a STEM program were girls (Skolverket, 2022). One study observed that high-achieving math students in Sweden consisted of 20000 students of which there were 11000 girls, implying a slight over-representation of girls. Despite this, many high-achieving girls do not apply for a science program in high school and even fewer choose a technical program. It then seems that high-achieving girls choose different educational paths. Of the 11000 high achieving girls observed, only 1600 could be found in a university engineering program, (Sveriges Ingenjörer, 2022).

In the ASPIRES project in the UK, students' aspirations were studied. Two reports have been published, the first one observed students aged 10-14, (Ker et al., 2013) and the second observed the same students in ages 14-19, (Archer, Moote, MacLeod, et al., 2020). These studies observed several factors relating to students' aspirations in STEM. Thousands of students were included in this study. ”The ASPIRES and ASPIRES 2 projects tracked a cohort of young people in England from age 10 to 19 (2009 – 2018), through over 40,000 surveys and 660 in-depth interviews with young people and parents/carers.” (Archer, Moote, MacLeod, et al., 2020, p. 5)

It was found that girls aspire to STEM careers to a lesser extent than boys and even if several factors are discussed in the project's publications, the largest differences were found between genders. This gap widens even further as students progress through the school grades. Girls are progressively less likely to identify as ”sciency”, an effect that in some cases were attributed to discouraging factors in school systems and culture (Archer, Moote, & MacLeod, 2020).

According to the studies conducted in the ASPIRES project many students found science interesting and had a positive view of the STEM field and it's professions, this attitude was also reinforced from their parents. Regardless of this, the majority did not aspire to pursue studies or a career in STEM. The perception of what professions are available in STEM were limited as was the perception of the usefulness of how studying STEM could be transferable to other areas. Those more interested in science however, were more inclined to aspire towards STEM.

Two of the most significant factors found were ”science capital” and identity. Science capital meaning social, economic and cultural background or environment, for example how many books are available in a student's home as well as parental educational background. Students socioeconomic background was also a factor where a stronger socioeconomic background was correlated with a higher probability for the student to aspire to a STEM career. An identity of being ”sciency” was a contributing factor, including level of self-estimation of the student’s own ability in science and mathematics. Identity is also influenced by gender, social environment, personal traits, culture and ethnicity.

In a literature study that draws it’s conclusions from many studies conducted on the topic of the choice to study STEM, it was concluded that girls have lower self-efficacy to perform in science and mathematics and that can result in girls being less likely to pursue a STEM career by enrolling in a higher education program (Bøe et al., 2011). The authors also claim among other factors that students with parents working in, or having a stronger interest in STEM are more likely to pursue such a career. Further the authors state that ”Young people’s expectation of success in STEM subjects is challenged by the subjects’ reputation as particularly difficult and demanding, which causes some students to shy away from these subjects.”, (Bøe et al., 2011, p. 23) which implies that self-efficacy in these subjects is a factor in what education and career is pursued. Some of those who do pursue a STEM education do this ”to keep their options open”, insinuating a perception of a STEM education to be transferable to other areas, however others seem to perceive a STEM education as too difficult to engage in to reach their extrinsic goals.

A project funded by the European Commission, IRIS (Interests & Recruitment in Science, Henriksen, 2012) aimed to answer among other questions ”What are the priorities, values and experiences on which young people base their educational choice?”. They conducted a questionnaire answered by almost 7000 STEM students enrolled in a higher education program in 5 European countries. The respondents strongly emphasized intrinsic values such as self-realisation and passion for the subject which influenced their self-identity. Women favoured idealistic goals such as helping people and the environment more than men. ”Good teachers”, especially for women, were the strongest in-school influence for choosing and continuing a STEM education. One finding from women in a STEM program in Denmark states ”[...] women still have to distance themselves from a female connoted practice and identity to become recognised as legitimate members of the STEM student community.” IRIS (Henriksen, 2012, p. 3). After the first year, students reported a discrepancy between their expectations and the reality of the teachings and it is stated in the report that “To cope with this gap, students need to renegotiate their educational choice narrative to make sense of the experiences.” which suggests identity and personal goals as a factor in pursuing and continuing a STEM education and career.

It was found by (Tytler, 2014) that students attitude and pursuit of science is complex and multifaceted. Tytler found that more and more young people, but especially girls, are reluctant to engage with the physical sciences because they perceive the identities of STEM professionals as incompatible with their own. It is also found in other studies that many of these fields have a masculine image that discourage girls. The identities of youth in advanced and wealthy societies are connected with late modern values such as self-realization, creativity and innovation, working with people and helping others, and making money, (Tytler, 2014, p. 17).

Students' attitudes towards science are shaped by their social and cultural values, as well as their personal experiences. This starts early in life as one study referenced by Tytler found that "[...] by age 14, students with expectations of science-related careers were 3.4 times more likely to earn a physical science and engineering degree than students without similar expectations." In addition, those 14-year-olds who performed well in mathematics were even more likely to undertake a STEM–related degree. (Tytler, 2014, p. 91). Socioeconomic status and cultural background as well as early developmental environment would then seem to be a contributing influence on a young persons identity that will affect whether or not a student pursue a STEM field.

Another literature review (Potvin & Hasni, 2014) examined interest, motivation and aspirations towards STEM in K-12 school grades (kindergarten and the first 12 years of school, including high school). One of the research questions in this study was "What do these articles teach us about the links that exist between I/M/A (Interest/Motivation/Aspirations) and other variables?". (Potvin & Hasni, 2014, p. 12). The authors found, similarly to other studies that students' engagement with science and technology is influenced by a multitude of factors, including their prior knowledge, experiences, gender, ethnicity, socioeconomic status, and the quality of teaching.

Potvin and Hasni (2014) found only a slight significant difference between genders, it was however more clear when separating the different subjects although still not a strong discrepancy. Girls were on average more inclined towards Biology, especially the fields that deal with nature. Boys favoured technology and physics more, among other subjects. Overall I/M/A declined with age. There are findings reported in the study where performance and self-efficacy in STEM subjects are correlated with higher I/M/A. The study also examined literature that studied influence of career aspirations and found that studies often reported "a link between I/M/A and the choice or intention to pursue [STEM] studies” but also that ”Students’ choices appeared to be mainly influenced by initial science literacy and school interventions, gender and culture, family background, self-esteem, previous achievements and hobbies or life experiences (especially for technology), but also by the negative perceptions that they held of S&T (Science & Technology) careers. Indeed, these careers were seen as dimly creative (except maybe Technology), and not people oriented”, (Potvin & Hasni, 2014, p. 15). Perhaps the most interesting finding in this study is that self-efficacy seems to influence students to pursue STEM studies as well as careers more than I/M/A. This suggests that a students’ confidence to succeed is one of the most important factors.

In summary the previous research studies indicate that girls are less likely to pursue STEM educations and careers for various reasons. Higher levels of interest and self-efficacy regarding STEM and STEM subjects in school are correlated with a higher rate of pursuing such education and careers. Stronger socioeconomic environment and higher parental educational background influence students to aspire towards STEM at a higher rate. Those that identify with STEM or STEM professionals or aspire towards a STEM career will more likely pursue STEM education. Several other factors, not included in this study, have also been identified as influencing a student’s educational pursuits.

Chapter 3

Method

The method used is a quantitative data analysis where the data has been gathered from surveys. The surveys have been answered by Swedish students in grade 9, the last year of schooling before high school. The school classes that participated are from a number of different schools and the different schools also differ regarding the socio-economic background of the students. The ambition of this study was to collect data from at least 300 students.

3.1 Surveys

When creating surveys there are some established practices that are commonly used. These practices has been established to meet challenges that arise when creating a survey for the purpose of data analysis. The book ”Medodpraktikan”, (Esaiasson et al., 2017) covers some of these challenges and how they can be handled.

General practices First of all the purpose of the survey need to be clear from the start for the respondents. Meaning what the collected data are going to be used for. This clarification will put the survey in a context and therefore help the respondent understand what is asked of them in each question. This context is laid out in the introduction message in at the beginning of the survey. In the same way the purpose of the survey for the sake of the researcher need to be clear, meaning the construction of the survey need to have a clear aim.

One of the most important factors affecting the quality of the data analysis is the response rate, meaning how many respondents answer the survey. To achieve a sufficient response rate, several aspects has been considered for this study. Many of these are even more important in a survey like the one in this study where the respondents are adolescents.The considerations taken in this survey regarding this are that it should be relatively short and the time it takes to answer the survey should be about 10 minutes, not more than 15 minutes. This means the number of questions need to be limited. Additionally the questions should be put in a simple way so that they are easy to understand. To achieve this, the chosen words should not be difficult or vague. The questions should be straightforward and focus on one question at a time. Lastly the questions should not be contradictions or negations, for example "Isn't it true that mathematics is a very interesting subject?".

3.2 Collecting data

The study focuses on three factors that might affect a student's choice when applying for a high school program:

- self perceived abilities
- interest in STEM subjects
- vision of their own future

Most questions in the survey are about these three factors but a few are meant to also collect data about gender, parents' educational background.

The survey was created in Microsoft Forms and sent out to teachers, via email, that had agreed to participate with one or more of their classes. A link to the survey and a QR code was attached to the email for the teacher to share with their students.

There was a challenge to find teachers, as many schools were contacted but only a few replied and even fewer agreed to participate. Most schools do not list the teachers' work emails directly, instead the principal or administrative office were contacted for them to pass the information along. This step was most likely the bottleneck of the process as the email most likely did not make it past the administrative office in many schools. When actual teachers were reached, many were inclined to participate as they would have an interest, for the sake of their profession, in a study of this sort. It is assumed however that the offices of the principal and/or administration did filter it out, perhaps not to burden their teachers who have a full schedule as it is.

The background and purpose of the survey was presented in the first page of the form to put it into context for the participants. This information explained that the survey examined whether or not the respondent applied to one of the STEM programs in high-school, and possible factors around this choice. It was stated that it is anonymous and voluntary and the estimated time it should take to complete the survey was given. The purpose of the survey was clearly stated along with contact information to the researcher. Finally a disclaimer was included that explained that by submitting the survey the respondent agreed to the data being used for data analysis. There was also a check for this as the first question in the survey where the respondent could consent.

The first part of the survey dealt with some background information about the student, namely gender and parental educational background. The choices were categorical. The second part dealt with interest, self-efficacy and attitude towards STEM. The third part collected data about values and desire when it comes to a future career. The second and third part of the survey used a Likert scale with four levels, meaning there were no neutral option. The last part of collecting data to be analyzed as independent factors asked what profession, if any, the student aspired to. This input was free text as there are a vast amount of professions. Lastly the respondent were asked to enter what high school program they had applied for in their first, second and third choice separately as free text. Inputs in the form of free text brings a challenge in the data analysis as much of that data need to be coded manually as well as risking nonsensical inputs.

The questions were formulated in such a way that the survey collected data about the factors of interest that were determined to be relevant according to previous research, and that could address the hypotheses presented in section 1.2.1. The survey in its' entirety can be found in Appendix B.

3.3 Data analysis

Data analysis is the field of extracting useful information from a data set by finding patterns and to interpret what the data says. A sub set of data analysis is statistical analysis that uses various statistical methods on a population of data. In this study a number of statistical methods have been applied for three main purposes: illustrating an overview of the data with cross tables and means, finding possible correlations between an independent variable, x, and the dependant factor y (the choice of high school program being a STEM program or Non-STEM program) as well as finding possible effect sizes of x on y.

There are several tools to chose from when performing data analysis. A common choice is using SPSS or other commercial software designed for that purpose. Another option is to use a programming language such as R, which is specifically created for data analysis. In this study, Python was used since it is known by the researcher beforehand as well as being a common tool for data analysis with many established libraries for this very purpose. Python libraries such as Pandas, numpy, scipy, stats, researchpy and others were utilized in the data analysis.

3.3.1 Pre-processing

Before statistical methods could be applied the data was pre-processed. The first step in this pre-processing was converting the collected data sets from Microsoft Forms, which are in the form of Excel files, to SQLite databases. The reason for this was to be able to use the extensive Python libraries for data analysis such as Pandas. Using Python data frame objects and SQLite is a straight forward process.

In the second step of the pre-processing, the data collected in the survey was coded to numeric data. This must be done to make it possible to apply the statistical methods or otherwise make the data more easily managed in Python. In the survey the respondents answered 17 questions of which 14 gathered information regarding the factors this thesis aims to study and 3 questions gathered information about their first three application choices for a high school program. The 14 questions were divided into a total of 48 independent variables of which some were used to create composite variables. The data type for y (choice of program) is nominal, meaning categorical without any inherent order of ranking. The data types for the independent variables are either nominal or ordinal, meaning categorical with an inherent order of ranking.

Most of the process of coding the data from the survey to numerical data was automated with Python. However some inputs from the respondents had to be coded manually and also has an element of interpretation of the raw data. The inputs of what high school program the respondent had applied for could for the most part be automated where the answer was put in one of three categories to be used in the analysis being the Science program, Technical program or a Non-STEM program. However, as this was a free-text input some answers were nonsensical in the context and were coded to a fourth category which was then removed in the data analysis. Another question where the input was in the form of free-text regarded the respondents' ambition for a future profession. This data was also coded manually. The data was coded to two categories, one being a STEM profession and the other a Non-STEM profession. This manual coding has an element of interpretation of what is to be considered a STEM profession. The inputs that were nonsensical in the context were coded to a third category and then removed from the data set when the factor ”preferred profession” was analyzed as an independent factor.

Some subsets of data were used to create a composite variable. The dependent factor is as stated previously the choice of high school program applied to. A student can make as many choices as they wish in this application but in this study they were asked to give their first three choices. The first, assumed to be the most preferable, has been used in this study as its own dependent factor and was coded to one of three categories being the science program, the technical program as well as any Non-STEM program. The three first choices was also used to create a composite variable that was coded to one of two categories: one category where only Non-STEM programs were applied to and the other where at least one of the three choices were towards either of the two STEM programs. This composite variable represents the group that at least have some interest in STEM education and at least *consider* taking on a STEM program. This is however a broad category while those choosing a STEM program as their first choice is more clearly a group that pursues a STEM education.

One of the independent variables is the student's parents' (or legal guardians') educational background, this was asked for both parents separately (with an option on the second parent to state that the respondent only have one parent). These two variables were used to create a composite variable and group the combinations of parental educational background into four categories.

The respondent stated in the survey their level of interest in each STEM subject in school separately as well as for various STEM topics generally known in society. They also stated the level of how they self-estimated their own ability in each STEM subject in school separately. Each of these subsets of data were used to create a composite variable of that subset.

3.3.2 Statistical methods

The statistical methods used in the data analysis in this study are presented here. A short description of each method is given along with when each method has been applied (for which data type) and the interpretation of the results of the method.

Cross-tables One way to visualize nominal data is with a cross-table. A cross-table usually shows the total number of data points or the ratio of each combination of two or more categories. Either of these representations can be done in two ways, row-wise or column-wise, meaning in what direction the total used as a base is summed. The two ways of doing it answers different questions. If the categories of the independent variable is each put in a different row and the dependent variable is each put in different columns, totaling row wise will answer the question what ratio of respondents belong to each category of the dependant variable for each category of independent variable. Totaling column wise will instead answer the question what ratio of respondents belong to each category of the independent variable for each different category of dependents variable. A cross table can also show the total ratio overall. A cross-table can be used to get an initial overview of how the data is divided among different categories of independent and dependent variables as well as possible correlations. (Esaiasson et al., 2017)

Averages For ordinal data the average value of the respondents' answers for each group can be calculated separately to show differences between the groups. Most questions in the survey used collects this kind of data. These averages answer the question if there are differences between the categories of high-school program choice for a multitude of questions regarding for example interest, self-perceived ability and attitudes about STEM. A risk with using the average as a means to distinguish between groups is that extreme values (outliers) can skew the average value, to see if this is occurring in a data set a measure of standard deviation can be calculated. This is however not a relevant factor in the data set in this study as the ordinal data is a limited scale between 0 and 3. (Esaiasson et al., 2017)

P-values and significance When using a statistical method a P-value is calculated which determines if what is calculated based on the selected data is statistically significant. It is the probability that the null hypothesis is true, the null hypothesis meaning that there is no difference in the means for example. The standard tolerance level usually used is 5% meaning that if the P-value is less than 0.05 the result is seen as statistically significant.(Howell, 2013)

Association between categories To determine the level of significance between two categorical variables there is a measure called Pearson's Chi-squared (χ^2). This method simply looks at the frequency in each category. To determine an effect size from an association χ^2 can be normalized which is done when calculating another measure called Cramer's V. This measure is a value between 0 and 1 where a result of 0 means there is no association between the variables and a result of 1 means there is a perfect association. (Esaiasson et al., 2017)

Comparing averages The averages between two groups regarding a specific variable can indicate that variable being a factor affecting the dependant variable. To determine if a difference in averages is statistically significant or if the difference could have appeared by coincidence, a so called t-test can be performed. The t-statistic value gives a measure using the difference in the means between two groups. The t-test shows if there is a non-zero difference in means between two groups. If there are more than two categories the t-test can be performed pair-wise. One such pair-wise t-test is the Bonferroni procedure, (Howell, 2013). If this difference is normalized that will give an indication of effect size. This is done by calculating a "Cohen's d" value. The way the Cohen's d can be interpreted, as (Cohen, 1977) describe, is as follows:

- Small effect size: Cohen's d around 0.2
- Medium effect size: Cohen's d around 0.5
- Large effect size: Cohen's d around 0.8 or higher

Logistic regression When the dependent variable (y) is nominal (categorical) a model for possible correlation can be fitted to the data regardless of the independent variable (x) being nominal or ordinal. The coefficients of the model says how much and in what direction y changes for an increase of 1 in x. The coefficients of the model can be used to retrieve the odds-ratio of y being in a certain category. One of the y categories is the reference and the odds-ratio gives the increase in odds of y being in one category in relation to the reference category. When y has more than two categories a multi-nominal logistic regression is performed which deals with that fact. (Agresti, 2019)

Chapter 4

Results

A total of 267 students have answered and submitted the survey designed for this study. The students are from five different schools. Considering the number of questions and respondents, the amount of collected data are substantial. The number of teachers who received the email are unknown since contact with school went through the schools administrative office.

A total of 14 questions have been organized into 48 columns of independent variables and 3 columns of dependant variables (The first three choices of high school program applied to by the student). The data constitutes both nominal, ordinal as well as scaled data where the independent variable is nominal. A total of 6 main factors have been isolated and tested for correlations and effect size. The data has been pre-processed in various ways depending on which factor and test that has been performed.

All the results can be found in Appendix A. Those results that are most significant for the discussion is presented here. As described in the methods section (3) all tests have been performed against the first choice (FC) of high school program that the student has applied to (with three categories of programs; Science, Technical and Non-STEM) as well as a composite variable(CV) being the first three choices of program with only two categories (Non-STEM and STEM choice where at least one of the three choices is one of the two STEM programs).

4.1 Gender

Cross-tables In Table 4.1 it is very clear that girls do not apply for the Technical program nearly as often as boys, only $\sim$ 2.3% compared to $\sim$24% for boys. Girls however are seen to apply for the Science program in a somewhat higher proportion than boys. In Table 4.2 it can be seen that the science program has more female applicants than males while the technical program has more male applicants at $\sim$89% compared to $\sim$11%. For the CV for choices boys seem to apply for a STEM program more often than girls as seen in Table 4.3-4.4, the gender differences is however not very large when combining the science and technical programs in a STEM category even if girls are still underrepresented.

Table 4.1: Cross-table for Gender and choice of first program.

	Science	Technical	Non-STEM	Total
Boys	20.9524	23.8095	55.2381	100
Girls	27.5591	2.3622	70.0787	100

Table 4.2: Cross-table for Gender and choice of first program.

	Science	Technical	Non-STEM
Boys	38.5965	89.2857	39.4558
Girls	61.4035	10.7143	60.5442
Total	100	100	100

Table 4.3: Cross-table for Gender and first three choices program.

	Non-STEM	STEM	Total
Boys	48.5714	51.4286	100
Girls	61.4173	38.5827	100

Table 4.4: Cross-table for Gender and first three choices program.

	Non-STEM	STEM
Boys	39.5349	52.4272
Girls	60.4651	47.5728
Total	100	100

Correlations for gender For the FC, with the Science and Technical programs separated, a Chi-squared test shows clear significance with a P-value below 0.05 and a effect size from Cramers V of ∼0.31 which is indicates a lower to medium strength association as seen in Table 4.5, however for the CV, Gender is not a significant factor having a P-value larger than 0.05. The effect size (ES) of ∼0.12 is low.

Table 4.5: Correlation between gender and first choice of program.

	Chi square	P value	Cramers v
Gender	24.926	0.0003524	0.3143

Table 4.6: Correlation between gender and the first three choices of program where atleast one is a STEM program.

	Chi square	P value	Cramers v
Gender	3.84222	0.427779	0.12

Logistic regression Results from a Logistic Regression (LR) model as seen in Table 4.7 for the Science program shows a P-value larger than 0.05 meaning there is no significant effect by gender and choosing the Science program. For the technical program however there is a clearly significant effect by gender as the P-value shows significance. The odds-ratio is ∼0.056 meaning the odds of choosing the technical program decreases with ∼95% ((0.056-1)*100) for girls.

When the Science program and technical program is not separated as in the CV there is a significant effect when choosing a STEM or Non-STEM program as the P-value is ∼0.03 and the Odds-ratio is 0.58 meaning a decrease of about 40% for the odds in choosing a STEM program for girls.

Table 4.7: Results from a logistic regression model on gender vs first choice of program.

	coef	P-value	Odds-ratio
Gender Tech	-2.887	< 0.01	0.056
Gender Science	0.103	0.742	1.109

Table 4.8: Results from a logistic regression model on gender vs first three choices of program.

	coef STEM	P-value STEM	Odds-ratio STEM
Gender	-0.534948	0.0388916	0.5857

4.2 Parental educational background

The respondent could give information about their parents educational background (if they knew) separately. That information was then used to create different groups of parents. One group is when both parents have a higher education (at most one parent has a higher education in STEM) and another where both parents have a higher education specifically in STEM. Summing the results for these two groups would give a single group where both parents have a higher education, STEM or Non-STEM.

Cross tables In the cross table in Table 4.10 it can be seen that those which choose the science program parents are less likely to only have at most a high school education. Over 50% of those choosing the science program in their first choice have parents whom are both higher educated, but this is true for the other groups of programs as well. Looking at the cross-table in Table 4.9, grouping for the different groups of parental educational background, there is again no clear pattern between groups of different parental educational background and choosing either of the two STEM programs or a Non-STEM program. It can be seen however that those who choose a Non-STEM program do not have parents where both are higher educated in specifically STEM.

Table 4.9: Cross table for different groups of legal guardians educational background and first choice of program, comparing the different groups of program

	Science	Technical	Non-STEM
Both at most highschool educated	16.3265	27.7778	11.9048
One higher educated	26.5306	16.6667	29.3651
Both higher educated	34.6939	27.7778	48.4127
Both higher educated in STEM	22.449	27.7778	10.3175
Total	100	100	100

Table 4.10: Cross table for different groups of legal guardians educational background and first choice of program, comparing the different groups of educational background

	Science	Technical	Non-STEM	Total
Both at most highschool educated	28.5714	17.8571	53.5714	100
One higher educated	24.5283	5.66038	69.8113	100
Both higher educated	20.4819	6.0241	73.494	100
Both higher educated in STEM	37.931	17.2414	44.8276	100

Looking at the CV and parental educational background in Table 4.11-4.12 show similar result. When both parents are higher education in STEM specifically their children seem to aspire more towards a STEM program.

Table 4.11: Cross table for different groups of legal guardians educational background and first three choices of program, comparing the different groups of educational background

	Non-STEM	STEM	Total
Both at most highschool educated	46.4286	53.5714	100
One higher educated	62.2642	37.7358	100
Both higher educated	65.0602	34.9398	100
Both higher educated in STEM	31.0345	68.9655	100

Table 4.12: Cross table for different groups of legal guardians educational background and first three choices of program, comparing the different groups of program

	Non-STEM	STEM
Both at most highschool educated	11.9266	17.8571
One higher educated	30.2752	23.8095
Both higher educated	49.5413	34.5238
Both higher educated in STEM	8.25688	23.8095
Total	100	100

Correlation There is no statistically significant correlation between parental educational background and choice of program. This is true for checking against both FC (Table 4.13) and CV (Table 4.14) with a P-value of ∼0.44 and ∼0.12 respectively.

Table 4.13: Correlation between educational background of legal guardians and the students first choice of program

	Chi square	P value	Cramers v
Education background of legal guardians	12.0487	0.441774	0.1249

Table 4.14: Correlation between educational background of legal guardians and the students first three choices of program where atleast one is a STEM program.

	Chi square	P value	Cramers v
Education background of legal guardians	11.997	0.151337	0.2157

Logistic regression LR models for parental educational background does not give significant results and Odds-ratios close to 0. This is true both for FC regarding both the science program and the technical program as well as for the CV. This can be seen in Table 4.15- 4.16 with P-values larger than 0.05.

Table 4.15: Results from a logistic regression model for parental educational background and first choice. *Three groups, low educated, one parent high education, both parents high education

	coef	P-value	Odds-ratio
Parental educational background Tech	-0.093	0.759	0.911
Parental educational background Science	-0.074	0.69	0.929

Table 4.16: Results from a logistic regression model for parental educational background and first three choices. *Four groups, low educated, one parent high education, both parents high education(only 1 in STEM), both parents high educated in STEM

	coef STEM	P-value STEM	Odds-ratio STEM
Parental educational background	0.122372	0.443992	1.13017

4.3 Interests and attitudes towards STEM

Two different kinds of STEM interests where asked about in the survey, the four different natural science subjects studied in primary school as well as mathematics and interests in various STEM topics generally known and discussed in society. The respondent could answer with a scale that was coded from 0 to 3.

Interests in STEM subjects in school

Averages Those that apply for the science program has a larger interest in all STEM subjects in school except for the Technology subject which is higher amongst those that apply for the technical program in their first choice. Those that apply for either of the two STEM programs have clearly higher level of interest in all STEM subjects as can be seen in Figure 4.1. This is true also for the CV seen in Figure 4.2. See Appendix A for more exact values.

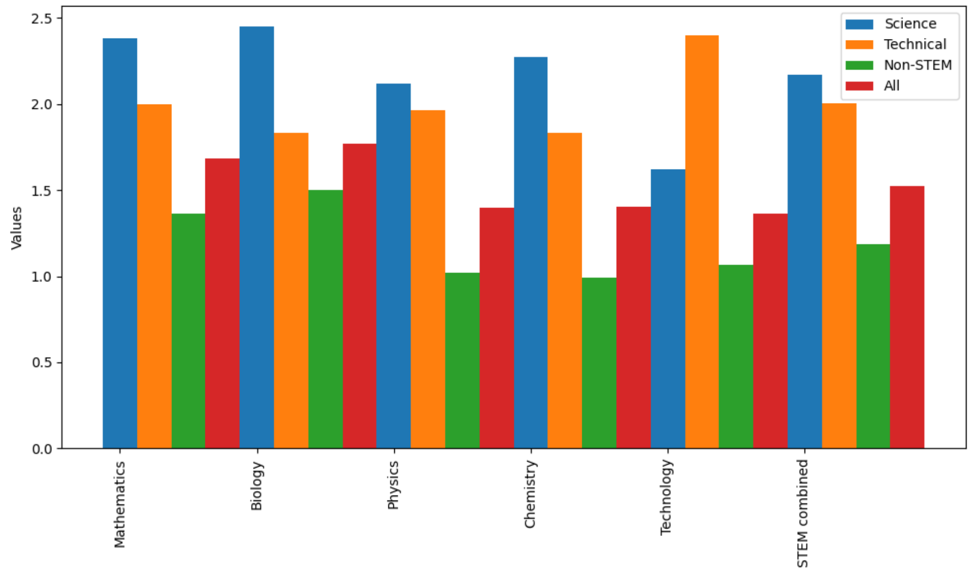

Figure 4.1: Difference in averages for the first choice of program.

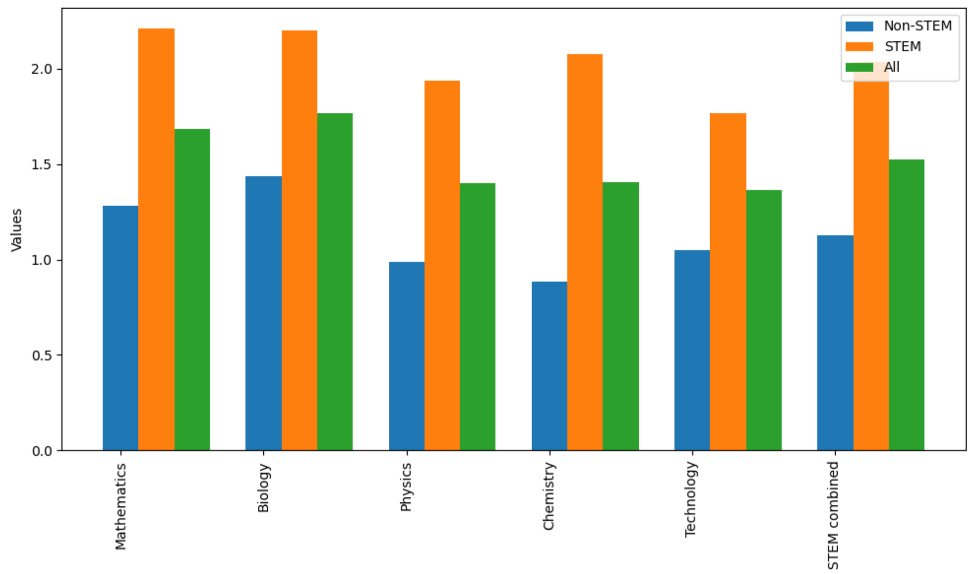

Figure 4.2: Difference in averages for the first three choices of program.

t-test The difference in average level of interest is statistically significant as seen when looking at the P-values that can be found in Table A.3 in the Appendix. This is true for interest in all STEM subjects and first choice of program when comparing both the science- and technical program. There is no significant difference in means in interest and choosing between the two

STEM programs except for the Biology and Technology subjects. For the CV there is similarly significant differences in the means of level of interest in all STEM subjects as seen in Table A.4. In these tables the Cohen's d values show the effect size caused by the difference in means. These effect sizes are for most subjects strong.

Logistic regression With LR the effect size of interest on program choice is significant for all the STEM subjects, as seen in Figure 4.3, with odds-ratios between ∼1.5 and ∼6 where interest in Chemistry is the highest and interest in Technology is the lowest at ∼2 when it comes to the science program applicants. For the composite variable of all STEM subjects the odds-ratio is ∼10 and ∼14 respectively for the two different STEM program applicant groups. The LR results for the CV in figure 4.4 shows very similar effects sizes. For the variable where all STEM subjects have been combined the odds-ratio is very high at ∼10.

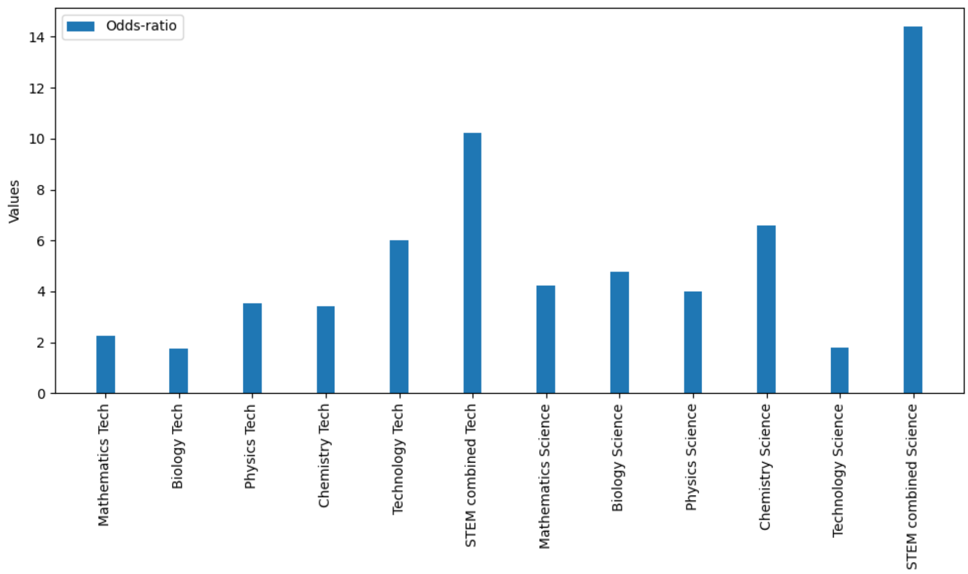

Figure 4.3: Odds-ratios for interest in STEM subjects vs the first choice of program.

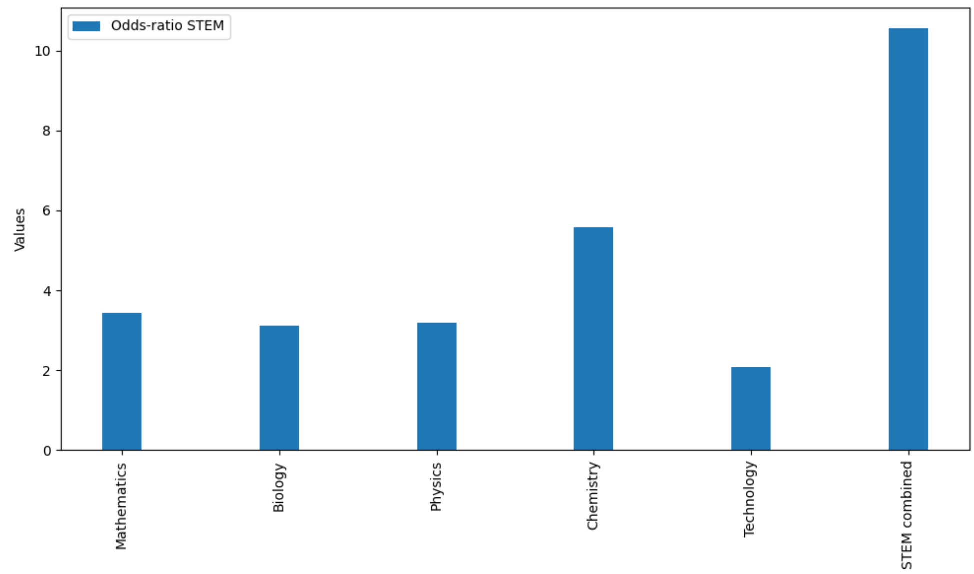

Figure 4.4: Odds-ratios for interest in STEM subjects vs the first three choices of program.

Interest in various fields

Averages The interest in various STEM topics differ clearly between those applying for a STEM program compared to those that apply for a Non-STEM program for their first choice as seen in Figure 4.5-4.6. This is true for all the topics although there are some topics that seem to interest those choosing a Non-STEM program compared to those choosing the Technical program even if the difference here is small. These topics are Astronomy, the human body as well as interest in the environment. The highest level of interest between the two STEM programs depend on the topic where those applying for the technical program has a some what higher interest in vehicles and engines, IT as well as technology in general. For the composite variable combining all the topics there is a difference between STEM and Non-STEM program applicants.

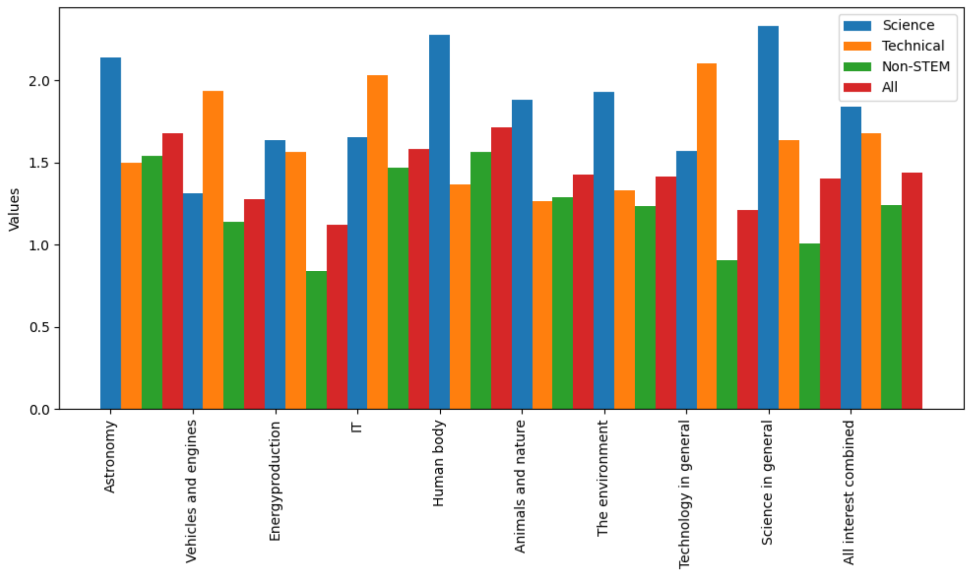

Figure 4.5: Difference in averages for the first choice of program.

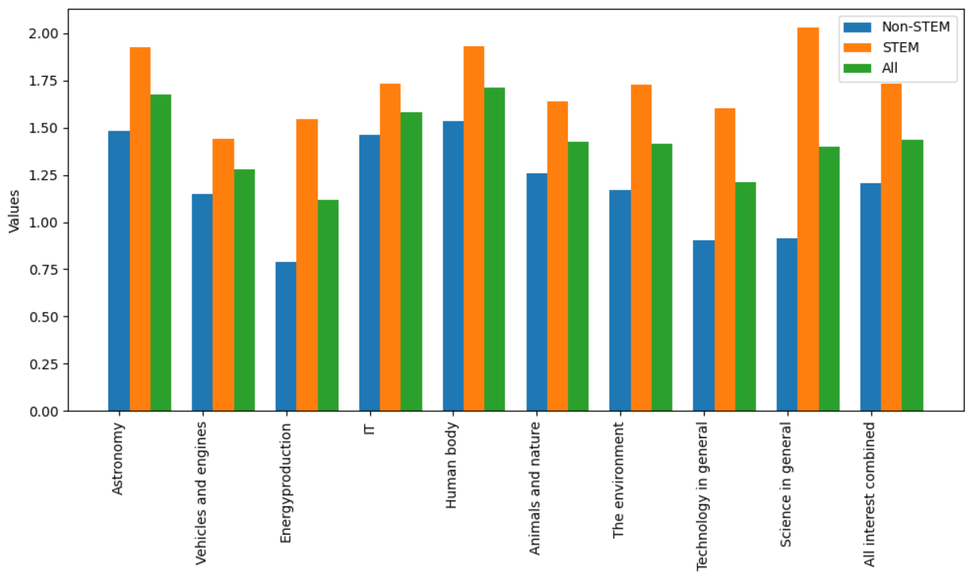

Figure 4.6: Difference in averages for the first three choices of program.

t-test Some of the differences in the means of the level of interests are significant with mostly medium to strong effect sizes. This is true both for when comparing with the first choice of program as well as for the broader group of applicants. It does vary depending on the STEM topic but for when all topics are composited the difference in means are statistically significant with a strong effect size when looking at the difference between the science program- and the non-stem program applicants. The effect size is significant and medium strength for the technical program vs non-STEM program applicants. The full table of these results is found in Table A.9-A.10

Logistic regression For several of the various STEM topics a LR model give significant effect sizes where the odds-ratios for choosing the science or technical program are all larger than 1 meaning as the level of interest increases so does the odds of applying for either of the STEM program. The results for some topics are however not significant, especially for choosing the technical program. This can be seen in Figure 4.7 where there are no bars in the histogram.

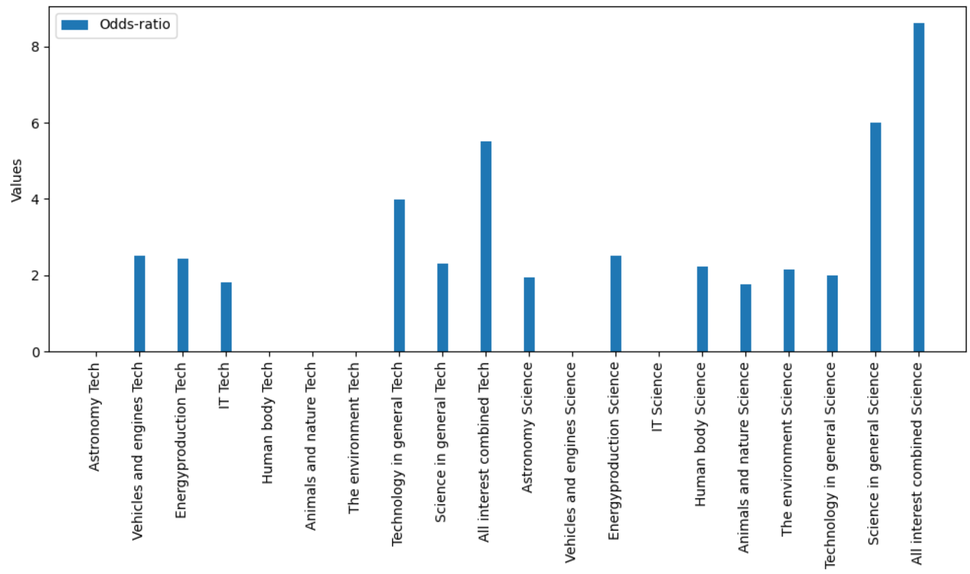

Figure 4.7: Odds-ratios for interest in various STEM subjects vs the first choice of program.

The LR model results for the CV as seen in figure 4.8 show that as the level of interest in each STEM topic increases so does the odds of choosing a STEM program instead of a Non-STEM program. The exception is the topic "The human body" which does not have a statistically significant effect size in the logistic regression. The exact values for the results can be found in Table A.11-A.12.

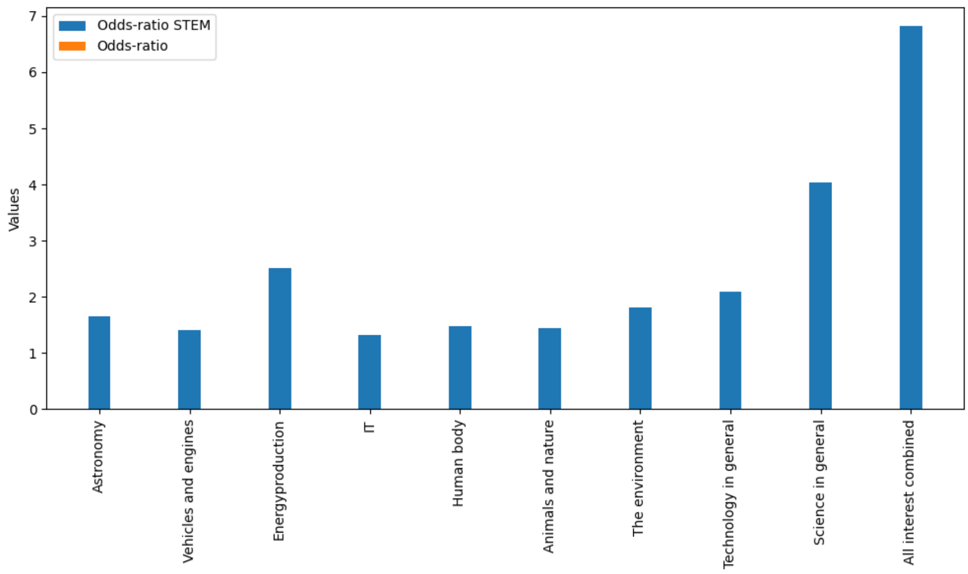

Figure 4.8: Odds-ratios for interest in various STEM subjects vs the first three choices of program.

Attitudes

Four statements were put the respondent about attitude on science and technology in general as well as STEM- and higher education. The respondent could answer with a scale that was coded from 0 to 3.

The four statements put to the respondent were

1. It's worth 3-5 years of higher education to attain my goals.
2. Regardless of my future profession I will have use of knowledge in STEM subjects.
3. Those who do scientific research are important to society.
4. Technological development is mainly positive for society.

Averages There is some difference in the averages between the groups for all the four questions. Those who choose either of the STEM programs have a more positive attitude regarding the four statements than those who choose a Non-STEM program. The science program applicants have a more positive attitude than the technical program applicants although the difference between those groups are small. The exception is regarding the fourth statements where the technical program applicants are slightly more positive to technological development, the difference is however very small.

The results for these attitude is seen in Table 4.17-4.18. Statement 2 stands out when comparing the STEM program applicants with the Non-STEM program applicants where the latter are clearly less positive.

Table 4.17: Averages of how much the respondent agree with the statement about STEM and education vs the first choice of program.

	Science	Technical	Non-STEM	All
S1	2.5	2.27586	2.02247	2.15472
S2	2.34483	2.13793	1.32584	1.63774
S3	2.77586	2.58621	2.25843	2.40755
S4	2.43103	2.44828	2.05056	2.17736

Table 4.18: Averages of how much the respondent agree with the statement about STEM and education vs the first three choices of program.

	Non-STEM	STEM	All
S1	1.98742	2.40566	2.15472
S2	1.25157	2.21698	1.63774
S3	2.20755	2.70755	2.40755
S4	2.03774	2.38679	2.17736

t-tests There is only a significance in the means for each of the statements when comparing the science program applicants with the Non-STEM program applicants as seen in Table 4.19. When looking at the CV in Table 4.18, only the first two statements show significant mean differences where those choosing a STEM program has a more positive attitude. The first two statements is regarding higher education and utility of STEM knowledge which does then seem to have an impact on choosing a STEM or Non-STEM program. The attitude on technological development and the importance of STEM research does not seem to significant mean differences for the program choices.

Table 4.19: Results for t-test on attitudes on STEM and education Vs first choice of program.

	Pair	t statistic	P value	Adjusted P value	Cohen's d
S1	Non-STEM vs Science	-2.86847	0.0045456	0.0136368	-0.441921
	Non-STEM vs Technical	-0.987536	0.324691	0.974073	-0.197079
	Science vs Technical	1.44454	0.15222	0.456659	0.324861
S2	Non-STEM vs Science	-7.71077	4.93515e-13	1.48054e-12	-1.18793
	Non-STEM vs Technical	-4.41608	1.72091e-05	5.16274e-05	-0.881302
	Science vs Technical	1.2514	0.214182	0.642545	0.281425
S3	Non-STEM vs Science	-3.83592	0.000165417	0.000496251	-0.590967
	Non-STEM vs Technical	-1.60835	0.109491	0.328473	-0.320974
	Science vs Technical	1.7813	0.0783943	0.235183	0.400593
S4	Non-STEM vs Science	-2.91806	0.00390563	0.0117169	-0.44956
	Non-STEM vs Technical	-2.44341	0.0155032	0.0465096	-0.487624
	Science vs Technical	-0.222295	0.824611	1	-0.0499916

Table 4.20: Results for t-test on attitudes on STEM and education Vs first three choices of program.

	Pair	t statistic	P value	Cohen's d
S1	Non-STEM vs STEM	-3.04696	0.0025701	-0.394777
S2	Non-STEM vs STEM	-9.06155	4.65222e-17	-1.17405
S3	Non-STEM vs STEM	-4.65327	5.40426e-06	-0.602898
S4	Non-STEM vs STEM	-3.42569	0.000721231	-0.443847

Logistic regression The LR model results in Table 4.21 show a significant effect on the choice of the technical program and the first two statements and a significant effect on the choice of the science program and the first three statements. The odds-ratios are all above 1 meaning the odds of choosing either of the two STEM program with a more positive attitude towards those statements. Similarly to the results of the t-test when looking at the CV in Table 4.22 only the first two statements show a significant effect.

Table 4.21: Results from a logistic regression model on attitudes on STEM and education vs the first choice of program.

	coef	P-value	Odds-ratio
S1 Tech	0.185	0.437	1.203
S2 Tech	1.2	< 0.01	3.321
S3 Tech	0.546	0.083	1.726
S4 Tech	0.598	0.044	1.819
S1 Science	0.547	< 0.01	1.728
S2 Science	1.472	< 0.01	4.356
S3 Science	1.024	< 0.01	2.784
S4 Science	0.544	0.012	1.723

Table 4.22: Results from a logistic regression model on attitudes on STEM and education vs the first three choices of program.

	coef	P-value	Odds-ratio
S1	0.419887	0.00914337	1.52179
S2	1.45334	9.80234e-12	4.27737
S3	0.884328	5.79896e-05	2.42136
S4	0.480698	0.00590669	1.6172

4.4 Self-efficacy

There are four different science oriented subjects studied in primary school as well as mathematics. The respondents were asked to give an estimate of how well they themselves estimate their own ability in these subjects. They gave an estimation that has been coded 0-3. A composite variable for the five subjects have been created as well. The respondents were also asked how much effort it would take to ”do well” if undertaking the science or technical program according to their own estimation. A composite factor was created for all the factors of self-perceived ability (excluding the composite variable for the five STEM subjects).

Averages Similarly to interest and the STEM subjects the average of self-perceived ability is higher for both the two STEM program applicants compared to the Non-STEM program applicants as seen in figure 4.9-4.10. The science program applicants have the highest in all these factors except for the subject of Technology where those choosing the technical program has a higher self-efficacy.

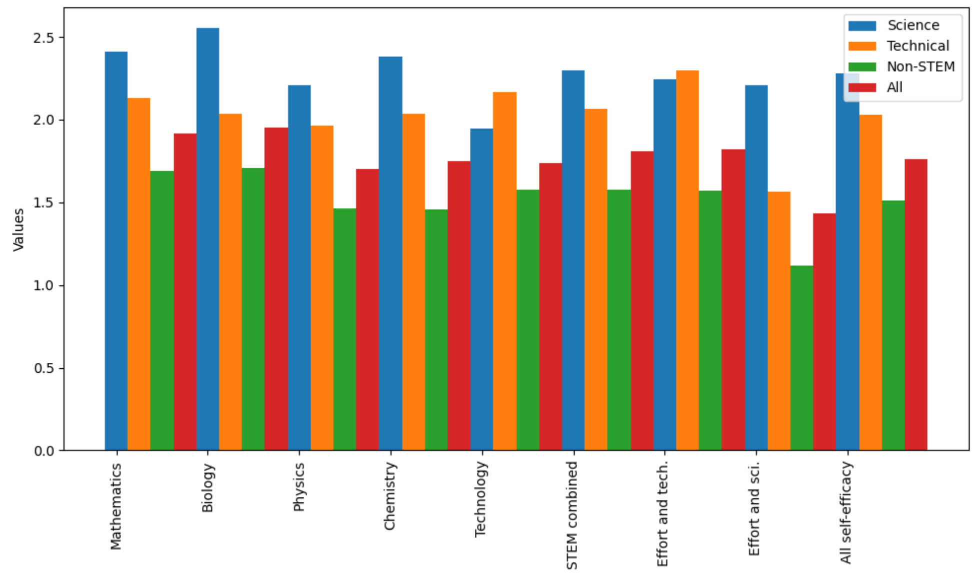

Figure 4.9: Difference in averages of self-efficacy for the first choice of program.

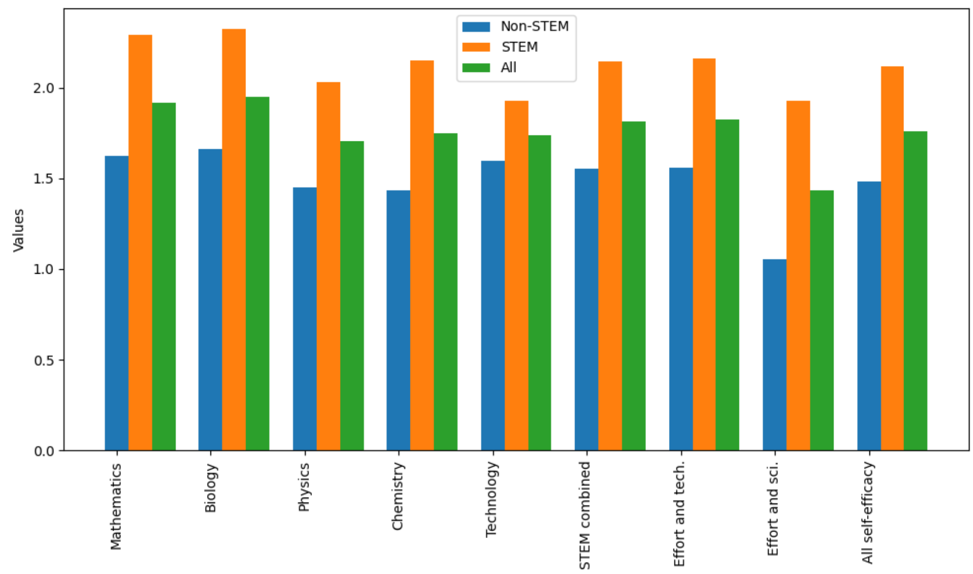

Figure 4.10: Difference in averages of self-efficacy for the first three choices of program.

t-test Table 4.23 show the results of the t-test for significance of the mean difference between the self-perceived ability for the five STEM subjects as well as the self-estimation of required effort in partaking the science or technical program. Comparing specifically the science program applicants and the Non-STEM program applicants there is a significant difference in all self-efficacy variables and choice of program as well as mostly strong effect sizes in the form of Cohen's d.

Comparing the technical program applicants to the Non-STEM program applicants there is a significant differences between the means in self-efficacy for for all variables except for Biology. The effect sizes for these comparisons range from low to medium. The composite variable for all self-efficacy factors show significant differences as well. Comparing the science and technical program applicants there is only significance for the subject of Biology and the self-perceived effort it would take to do well in the science program specifically.

Table 4.24 for the CV show significant differences in means for all the factors on self-efficacy and choice of program where the STEM programs applicants have a higher average than the Non-STEM applicants in all cases and mostly medium to strong effect sizes.

Table 4.23: Results for t-test on self-perceived ability Vs first choice of program.

	Pair	t statistic	P value	Adjusted P value
Mathematics	Non-STEM vs Science	-5.74469	3.20447e-08	9.61342e-08
	Non-STEM vs Technical	-2.6538	0.00866356	0.0259907
	Science vs Technical	1.83933	0.0693179	0.207954
Biology	Non-STEM vs Science	-7.63166	7.98982e-13	2.39695e-12
	Non-STEM vs Technical	-2.10962	0.0362581	0.108774
	Science vs Technical	3.4996	0.000740651	0.00222195
Physics	Non-STEM vs Science	-6.15832	3.68748e-09	1.10624e-08
	Non-STEM vs Technical	-3.00671	0.00301418	0.00904255
	Science vs Technical	1.39423	0.166841	0.500523
Chemistry	Non-STEM vs Science	-7.94606	1.15977e-13	3.47931e-13
	Non-STEM vs Technical	-3.55474	0.000482139	0.00144642
	Science vs Technical	2.35754	0.0206661	0.0619983
Technology	Non-STEM vs Science	-2.87904	0.00440168	0.013205
	Non-STEM vs Technical	-3.57795	0.000443875	0.00133163
	Science vs Technical	-1.26091	0.210753	0.632258
STEM combined	Non-STEM vs Science	-7.90066	1.53634e-13	4.60902e-13
	Non-STEM vs Technical	-3.73732	0.000248841	0.000746523
	Science vs Technical	1.95243	0.0541403	0.162421
Effort and tech.	Non-STEM vs Science	-4.59191	7.56181e-06	2.26854e-05
	Non-STEM vs Technical	-4.04826	7.62411e-05	0.000228723
	Science vs Technical	-0.300014	0.76489	1
Effort and sci.	Non-STEM vs Science	-8.50248	3.46733e-15	1.0402e-14
	Non-STEM vs Technical	-2.67433	0.00816969	0.0245091
	Science vs Technical	3.56366	0.000599586	0.00179876
All self-efficacy	Non-STEM vs Science	-9.02856	1.13645e-16	3.40936e-16
	Non-STEM vs Technical	-4.39318	1.89316e-05	5.67947e-05
	Science vs Technical	2.28247	0.0249294	0.0747883

Table 4.24: Results for t-test on self-perceived ability Vs first three choices of program.

	Pair	t statistic	P value	Cohen's d
Mathematics	Non-STEM vs STEM	-6.47727	5.23741e-10	-0.839223
Biology	Non-STEM vs STEM	-6.87033	5.46714e-11	-0.890149
Physics	Non-STEM vs STEM	-5.47099	1.12317e-07	-0.708845
Chemistry	Non-STEM vs STEM	-7.07244	1.65542e-11	-0.916335
Technology	Non-STEM vs STEM	-3.05128	0.00253478	-0.395337
STEM combined	Non-STEM vs STEM	-7.37669	2.63319e-12	-0.955755
Effort and tech.	Non-STEM vs STEM	-5.01382	1.03721e-06	-0.649612
Effort and sci.	Non-STEM vs STEM	-8.00558	5.10756e-14	-1.03724
All self-efficacy	Non-STEM vs STEM	-8.60176	1.03517e-15	-1.11448

Logistic Regression The effect size from all factors on self-estimation and choice of program, seen in figure 4.11, are significant and quite substantial. The odds-ratios range from ∼2 to as high as 10.5∼ or even ∼17 for the composite variable for all the self-effiacy factors when looking at the science program applicants. Meaning that when combining all the self-efficacy factors an increase of 1 means the odds of applying for the science program as the first choice increases with a factor of ∼17. For the composite of all self-efficacy factors and choosing the technical program an increase of 1 in this composite variable means the odds of applying for the technical program increases with a factor ∼8.7

For the CV of the first three choices, seen in Table 1.40, the results also show significance in all the factors and choosing a STEM or Non-STEM program with odds-ratios ranging between ∼2 and ∼10 for the all the factors combined.

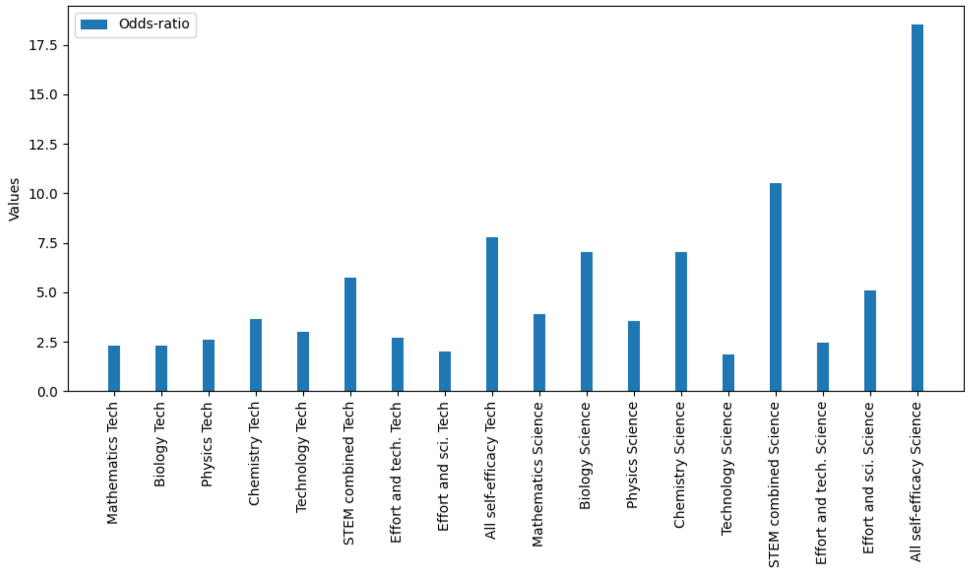

Figure 4.11: Odds-ratios for self-efficacy in STEM subjects vs the first choice of program.

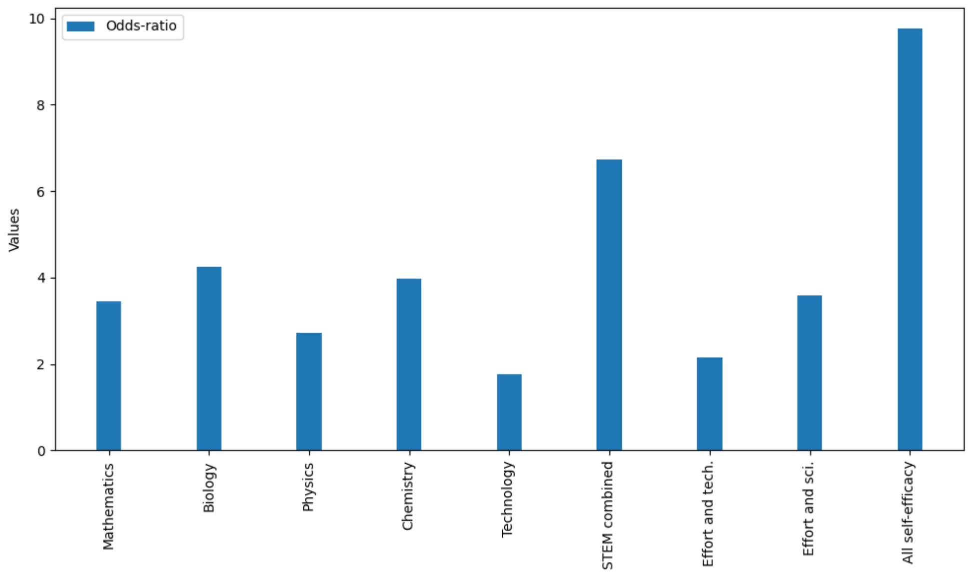

Figure 4.12: Odds-ratios for self-efficacy in STEM subjects vs the first three choices of program.

4.5 Vision of the future

The respondent were asked to give their ambition for preferred professions. Respondents gave two professions that were used to create a composite factor where if at least one of the preferred professions were interpreted as a STEM profession the respondent were grouped in one category and if none of the preferred professions were interpreted as a STEM profession they were grouped in a second group.

The respondents were also asked to rank what is important in their adult life when it comes to their profession (8 categories) as well as what type of tasks they would most like to have in their future professions (9 categories). Depending on how high each category were ranked it was ranked 0-7 and 0-8 respectively. The starting position for all categories were randomized for each respondents. These results have been excluded since at the time of analysis was determined that this part of the survey was formulated too generally and required too much interpretation of what was meant.

Ambition for a profession

Cross tables In Table 4.25 it is seen that those who aspire to a non-STEM profession for the most part, 85%, apply for a non-STEM high school program, however a few still apply for the science program, 11%, and even fewer, 3.7% apply for the technical program. Of those that do aspire to a STEM program the majority do apply for either of the STEM programs though some aspire to a STEM profession but do still apply to a non-STEM program.

In Table 4.26 it is seen that of those applying to either of the STEM programs also aspire to a STEM profession and of those who apply for a non-STEM program 20% still have aspirations towards a STEM profession.

Table 4.25: Cross-table for ambition regarding future profession and first choice of program. *Row wise.

	Science	Technical	Non-STEM	Total
Non-STEM profession	11.1111	3.7037	85.1852	100
STEM profession	45.6522	26.087	28.2609	100

Table 4.26: Cross-table for ambition regarding future profession and first choice of program. *Column wise.

	Science	Technical	Non-STEM
Non-STEM profession	26.3158	17.2414	81.5603
STEM profession	73.6842	82.7586	18.4397
Total	100	100	100

Tables 4.27-4.28 show similar patterns. The type of profession the student aspire to for the most part coincide with what program is applied for.

Table 4.27: Cross-table for ambition regarding future profession and first three choices of program. *Row wise.

	Non-STEM	STEM	Total
Non-STEM profession	78.5185	21.4815	100
STEM profession	20.6522	79.3478	100

Table 4.28: Cross-table for ambition regarding future profession and first three choices of program. *Column wise.

	Non-STEM	STEM
Non-STEM profession	84.8	28.4314
STEM profession	15.2	71.5686
Total	100	100

Correlations Regardless of looking at the first choice of program or the CV for the first three choices there is a clear significant correlation between the ambition of a STEM or Non-STEM profession and choice of program as seen in Tables4.29-4.30. There is a medium strength of association in both cases of ∼0.54 for the Cramers V value.

Table 4.29: Correlation between ambiton regarding future profession and the first choice of program

	Chi square	P value	Cramers v
Ambition regarding future profession	73.9826	6.21603e-14	0.5431

Table 4.30: Correlation between ambiton regarding future profession and the first three choices of program.

	Chi square	P value	Cramers v
Ambition regarding future profession	74.0702	3.13368e-15	0.5425

Logistic regression As in the test of correlation with the t-test the LR models shows significant effect sizes on choice of program from having an ambition of a Non-STEM or STEM profession. The odds-ratios are large as seen in Tables 4.31-4.32.

Table 4.31: Results from a logistic regression model on ambiton regarding future profession and the first choice of program.

	coef Tech.	P-value	Odds-ratio	coef Sci.	P-value S
Ambition regarding future profession	3.04672	1.44161e-08	21.0462	2.50772	1.40227e-

Table 4.32: Results from a logistic regression model on ambiton regarding future profession and the first three choices of program.

	coef STEM	P-value STEM	Odds-ratio STEM
Ambition regarding future profession	2.67726	1.07026e-15	14.5451

Chapter 5

Discussion

Most factors studied have been shown to be significant to some degree. This is unsurprising as they have already been identified and discussed at length in many previous studies in one form or another. The findings here are still interesting since many factors have been found to be significant, some with stronger associations or effect sizes than others, even with a relatively low sample size. It is however also a reason for caution since a smaller sample size have a higher risk of overfitting models such as logistic regression. It also needs to be considered that the answers submitted are subjective and given by adolescents whose temperament fluctuates significantly.

What affects an individual's choice for anything is a very complex process, as is explaining such things as motivation and attitudes, not to mention self-perception. When it comes to a student pursuing STEM or not, in this study a few factors were selected while others were excluded, some previously identified while others are yet unknown. It should be mentioned as well that no interdependence between independent variables have been tested for in this study and therefore no secondary effects are accounted for.

The factors gender, parental educational background, interest, self-efficacy, attitude towards STEM, career aspirations as well as values and desires have been studied. Other factors that are not studied but could be influential in a student's educational pursuits are for example ethnicity, culture or language, socioeconomic background parameters (except for education of parents) such as science capital, affluence, social environment. Effects of teaching methods or classroom environment is not taken into account either.

Gender Gender is perhaps the most studied factor of all in this field and the findings are for the most part coherent. The hypothesis therefore was that there would be a discrepancy between boys' and girls' aspirations towards STEM and their choice of a STEM high school program. The results showed this when it comes to applying for the technical program but not for the science program. Almost no girls apply for the technical program whilst the ratio of boys and girls applying for the science program is close to 50/50. Since the contents of the two programs doesn't differ that much this could be explained by girls perception of technology as a field and technology professions, such as engineering, as masculine. It could also be explained by the fact that girls, even though interested in STEM subjects, are more inclined to be interested in Biology which there is less of in the technology program. When looking at the broader category represented by the composite variable, gender was again found to be a significant factor. Since close to no girls apply for the technical programs in effect they only have one of two STEM programs that they will choose from. However if the proportion of girls and boys having aspirations towards STEM were the same the girls would then be twice as likely to choose the science program, which the evidence doesn't show. It can therefore be argued that girls aspire towards STEM at lower rates than boys.

Parental educational background Previous studies have shown indications that students with parents who are highly educated are more likely to pursue a STEM education themselves. There are many other factors connected to the educational background of parents such as science capital, resources and an environment of affluence so this factor is a complex parameter. The results of this study does not show a clear pattern that indicated that the parents educational background influence a student towards STEM compared to other high school programs. There were also no significant correlations or effect sizes. One explanation could be that the social mobility in Sweden is one of the highest in the world, (Geiger et al., 2020). It could therefore be argued that society provides enough resources and opportunities to compensate for differences in the effect of parental educational background. I could also be that this effect just isn't apparent in this particular study.

It should also be considered that the respondents of the survey entered what category each parent belong to separately and this data was then used to create four groups of combinations of parents' educational background. Other choices for these groups by the researcher may have lead to different results.

Interest The results clearly show that those that apply for the technical program have a higher interest in all STEM subjects in school compared to those applying for a Non-STEM program. Those applying for the science program have even higher levels of interest. This is evident from the average level of interest that is higher and there is significant association between these variables and choice of program, the effect sizes are also fairly strong.

One interesting difference here is that the subject of technology interest those applying for the technology program more than those applying for the science program and Biology seem to interest applicants for the technology program quite little. This is coherent with what was discussed about gender and girls not applying for the technology program while previous research states that girls are more interested in Biology than Technology and Physics.

This is also supported by the results from the analysis of data collected on STEM subjects outside of school where those choosing a STEM program have a higher interest but the topics "The human body" and "Environment" are lower for those applying for the technical program compared to those choosing a Non-STEM program. When combining all the topics into one variable the difference between the two STEM programs are quite small caused by level of interest being higher for one STEM program or the other depending on the topic. Applicants for the science program versus the technical program are interested in different fields of STEM. The hypothesis that higher interest in STEM subjects drive students to pursue STEM education at a higher rate as indicated by previous research are supported by the results of the data analysis.

Attitudes The different groups of applicants do seem to differ when it comes to attitudes about STEM in society and STEM education. Those applying for the science program has a more positive attitude overall compared to those applying for a Non-STEM program as well as when comparing to applicants for the technical program, for the latter the exception is for the fourth question put to the survey participants "Technological development is mainly positive for society." where those applying for the technical program are slightly more positive. Previous research has stated that those who view professionals in STEM more positively are more likely to pursue a STEM career themselves.

The largest difference in attitude is seen for the second question "Regardless of my future profession I will have use of knowledge in STEM subjects." where those applying for a Non-STEM program do not agree nearly as much as those who do apply for a STEM program. This is unsurprising and also unfortunate. It implies that school teachings can improve when conveying the usefulness of STEM knowledge and its transferability to other areas.

Overall attitude does show to have a significant association as well as a positive effect size for choosing either of the STEM programs compared to choosing a Non-STEM program. This could be explained by the expectancy-value model that posits that those who put a higher value to something (in this case STEM studies and STEM development in society) are more likely to pursue tasks that raises their competence in that field.

Self-efficacy Respondents gave an estimate of their ability in the STEM subjects in school as well as how much effort it would take to do well in the science and technical program, the answers submitted give an indication of self-efficacy in STEM. Similarly to interest, those applying for the science program show the highest self-efficacy in all subjects compared to those applying for a Non-STEM program and also compared to the technical program applicants except for the subject of Technology where the latter group has the highest self-efficacy. The differences in averages are statistically significant as shown by the t-test and the effect size given by the Cohen's d calculations.

The odds-ratio taken from the logistic regression are quite remarkable, with odds-ratio ranging from $\sim$2 to as high as $\sim$10.5 or even $\sim$17 for the variable where all other self-efficacy variables have been combined. It must be considered that the logistic regression model here is overfitted caused by too few data points. These are very strong effect sizes, extreme in some cases, implying that self-efficacy could be a major contributing factor for pursuing STEM. More so than interest and attitude as well as gender and parental educational background. Even for the broader group of the composition of the first three choices the the odds-ratio range from $\sim$1.7 and $\sim$9.3. This group represents those that at least consider a STEM program. The odds-ratios for choosing a STEM program is clearly higher for self-efficacy than interest.

An interesting fact is that the results show a clear difference in how much effort it would take to do well in the science program as compared to the technical program. Even if many respondents answer that the technical program would require much effort the effort the respondents assume it would take to do well in the science program is significantly higher, even those applying for the technical program estimate a significantly higher effort for the science program on average. As mentioned previously the two STEM programs do not differ drastically so this implies a general perception of the science program in particular as hard and perhaps "only for the smart students". It should be emphasized here that the articulation of these questions in the survey asks how much effort it would take to ”do well” in either of the two STEM programs. How a respondent interprets ”doing well” is highly subjective and will differ among students.

These results are coherent with previous research that has found self-efficacy to be a strong influence as well as being coherent with the expectancy-value model for motivation. Those that expect to do well in a task (in this case succeeding when studying in a STEM program) are more likely to pursue that task. It could also be argued that this implies identity being an influence as well, those that identify as someone who is competent in STEM subjects are more likely to envision themselves studying STEM as well as envision themselves in a STEM career.

Ambitions for profession Students who aspire to a profession in STEM are much more likely to apply for either of the STEM program even if a few of those who apply for a STEM program do not have a STEM profession in mind. At least not according to the collected data in this study. This is seen in the cross table as well as being statistically significant and having positive effect sizes in the form of Cramer’s V strength of association and positive odds-ratios.

The respondents answered what their first and second preferred profession is and then a composite variable was created where if either of the two submitted professions were a STEM profession the composite variable was coded as the student having aspirations towards STEM. Therefore a STEM profession might not be the first or only aspiration. This needs to be accommodated when analyzing these results. In addition to this inputs like ”entrepreneur” or ”CEO” was not coded as being a STEM profession even if that is the field the respondent could have in mind.

A notable fact is that the data indicates that a significant proportion of those that apply for a non-STEM program still aspire to a STEM profession. This indicates that some students who aspire towards a STEM profession have another path in mind or simply hasn’t considered a long term educational path. In the same way some of those who do apply for a STEM program have a non-STEM profession in mind. This is unsurprising as graduating from either of the STEM programs makes the student eligible for most higher education programs, leaving future educational possibilities open.

These results can be explained by the expectancy-value model since it states that those who put a higher value to a task are more likely to pursue it. Meaning in this case that those who aspire to a STEM profession will put a higher value in the time and effort it would take to become competent in the STEM subjects studied in a STEM high school program. Most likely, the students who aspire to a STEM profession also have a positive attitude to STEM professionals and may already identify as someone who would commit to such tasks in the future.

Values and desires Data was collected about the respondents values' and desired tasks in a future profession. In the analysis process the author determined that this part of the survey was ill-formulated. The statements that were ranked were too general and there were too much room for subjective interpretation by the respondent of what was meant with most of the statements. This part of the data collection has because of this been excluded from the analysis and discussion.

Conclusions The analysis of the data collected in this study has shown that most of the factors studied are likely to influence a student's choices to pursue or not pursue a STEM program in high school. It could not be shown in this study that parental educational background was a factor. A student's self-efficacy in STEM subjects were shown to be the most influential variable. Gender and ambition for future profession was also seen to have strong effect sizes in the shape of increasing odds-ratios for higher self-efficacy but lower odds-ratios for girls for pursing a STEM program, especially for the technical program for which there are almost no girls applying. Interests in STEM subject inside and outside of schools STEM subjects as well as attitude was shown to indicate a positive influence on applying for a STEM program, however not as strong as the former factors mentioned.

It should be noted that many schools were contacted, through the administrative office of each school. If the administrative staff chose to forward the information to teachers is unknown. How many teachers who actively chose not to participate with their students is also unknown as is those teachers reasons. It is assumed there are a number of these cases of non-responses which could have a statistical effect. This has not been considered in the analysis.

If schools and society wish to increase the number of STEM professionals there could be a positive effect if more girls are inspired to pursue STEM. In general it would most likely be beneficial if students self-efficacy was raised along with interest. One aspect that has also been raised in previous research is the lack in education about the various STEM professions that exist. Schools should also improve in conveying the usefulness and transferability of STEM knowledge to other tasks and professional fields.

A subset of previously identified factors have been studied in this work, there are however many others that can influence a student's choices. Some of these are outside the control of school.

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Appendix A

Results

This appendix show the results that are not shown in chapter sec:Results.

Table A.1: Level of interest in STEM subjects in school for different groups of first choice of program.

	Science	Technical	Non-STEM	All
Mathematics	2.37931	1.96552	1.40449	1.67925
Biology	2.44828	1.7931	1.55056	1.77358
Physics	2.12069	2	1.07303	1.40377
Chemistry	2.27586	1.86207	1.05618	1.41132
Technology	1.62069	2.37931	1.12921	1.37358
STEM combined	2.16897	2	1.2427	1.5283

Table A.2: Level of interest in STEM subjects in school for different groups of first three choices of program.

	Non-STEM	STEM	All
Mathematics	1.32704	2.20755	1.67925
Biology	1.49686	2.18868	1.77358
Physics	1.03774	1.95283	1.40377
Chemistry	0.962264	2.08491	1.41132
Technology	1.11321	1.76415	1.37358
STEM combined	1.18742	2.03962	1.5283

Table A.3: Results for t-test on interest in schools STEM subjects Vs first choice of program.

	Pair	t statistic	P value	Adjusted P value
Mathematics	Non-STEM vs Science	-7.26044	5.66937e-12	1.70081e-11
	Non-STEM vs Technical	-3.02496	0.00280473	0.00841418
	Science vs Technical	2.35766	0.020687	0.0620609
Biology	Non-STEM vs Science	-6.80031	8.62385e-11	2.58715e-10
	Non-STEM vs Technical	-1.30419	0.193631	0.580892
	Science vs Technical	3.86983	0.000212911	0.000638734
Physics	Non-STEM vs Science	-8.07739	3.50343e-14	1.05103e-13
	Non-STEM vs Technical	-5.20642	4.66614e-07	1.39984e-06
	Science vs Technical	0.601521	0.549094	1
Chemistry	Non-STEM vs Science	-9.38143	5.90369e-18	1.77111e-17
	Non-STEM vs Technical	-4.3571	2.08265e-05	6.24795e-05
	Science vs Technical	2.49962	0.0143549	0.0430647
Technology	Non-STEM vs Science	-3.3549	0.000926144	0.00277843
	Non-STEM vs Technical	-6.57397	3.98284e-10	1.19485e-09
	Science vs Technical	-3.71618	0.000361294	0.00108388
STEM combined	Non-STEM vs Science	-9.5066	2.48519e-18	7.45557e-18
	Non-STEM vs Technical	-5.38045	2.01982e-07	6.05945e-07
	Science vs Technical	1.24098	0.218025	0.654076

Table A.4: Results for t-test on interest in schools STEM subjects Vs first three choices of program.

	Pair	t statistic	P value	Cohen's d
Mathematics	Non-STEM vs STEM	-8.04375	2.99298e-14	-1.00863
Biology	Non-STEM vs STEM	-6.2344	1.7967e-09	-0.781747
Physics	Non-STEM vs STEM	-8.23517	8.46712e-15	-1.03263
Chemistry	Non-STEM vs STEM	-10.5891	4.67245e-22	-1.32779
Technology	Non-STEM vs STEM	-5.29216	2.54997e-07	-0.663597
STEM combined	Non-STEM vs STEM	-10.3661	2.46386e-21	-1.29983

Table A.5: Results from a logistic regression model on interest in STEM subjects in school vs first choice of program.

	coef	P-value	Odds-ratio
Mathematics Tech	0.697	< 0.01	2.009
Biology Tech	0.395	0.109	1.485
Physics Tech	1.222	< 0.01	3.395
Chemistry Tech	1.129	< 0.01	3.092
Technology Tech	1.54	< 0.01	4.666
STEM combined Tech	2.029	< 0.01	7.608
Mathematics Science	1.361	< 0.01	3.902
Biology Science	1.408	< 0.01	4.089
Physics Science	1.294	< 0.01	3.646
Chemistry Science	1.672	< 0.01	5.322
Technology Science	0.468	< 0.01	1.596
STEM combined Science	2.366	< 0.01	10.657

Table A.6: Results from a logistic regression model on interest in STEM subjects in school vs first three choices of program.

	coef STEM	P-value STEM	Odds-ratio STEM
Mathematics	1.14858	2.49223e-10	3.15372
Biology	0.968761	3.8733e-08	2.63468
Physics	1.11187	3.35375e-11	3.04003
Chemistry	1.51568	4.69417e-14	4.55253
Technology	0.625102	4.7124e-06	1.86844
STEM combined	2.09993	9.09661e-14	8.16558

Table A.7: Level of interest in various STEM topics for different group for first choice of program.

	Science	Technical	Non-STEM	All
Astronomy	2.13793	1.48276	1.58427	1.69434
Vehicles and engines	1.31034	1.89655	1.14607	1.26415
Energyproduction	1.63793	1.55172	0.88764	1.12453
IT	1.65517	2.10345	1.5	1.6
Human body	2.27586	1.31034	1.58427	1.70566
Animals and nature	1.87931	1.2069	1.32022	1.43019
The environment	1.93103	1.27586	1.24719	1.4
Technology in general	1.56897	2.06897	1	1.24151
Science in general	2.32759	1.58621	1.05056	1.38868
All interest combined	1.84061	1.65517	1.27915	1.44319

Table A.8: Level of interest in various STEM topics for different group for first three choices of program.

	Non-STEM	STEM	All
Astronomy	1.55346	1.90566	1.69434
Vehicles and engines	1.15094	1.43396	1.26415
Energyproduction	0.849057	1.53774	1.12453
IT	1.49686	1.75472	1.6
Human body	1.56604	1.91509	1.70566
Animals and nature	1.30818	1.61321	1.43019
The environment	1.19497	1.70755	1.4
Technology in general	1	1.60377	1.24151
Science in general	0.974843	2.00943	1.38868
All interest combined	1.25632	1.72348	1.44319

Table A.9: Results for t-test on interest Vs first choice of program.

	Pair	t statistic	P value	Adjusted P value	C
Astronomy	Non-STEM vs Science	-3.7928	0.000189662	0.000568985	-0
	Non-STEM vs Technical	0.491033	0.623928	1	0.
	Science vs Technical	3.17133	0.0021112	0.00633359	0
Vehicles and engines	Non-STEM vs Science	-1.09926	0.272784	0.818353	-0
	Non-STEM vs Technical	-3.76712	0.000215789	0.000647368	-0
	Science vs Technical	-2.67187	0.0090396	0.0271188	-0
Energyproduction	Non-STEM vs Science	-5.6401	4.88102e-08	1.46431e-07	-0
	Non-STEM vs Technical	-3.69726	0.000279769	0.000839306	-0
	Science vs Technical	0.4418	0.659756	1	0
IT	Non-STEM vs Science	-1.0844	0.279302	0.837905	-0
	Non-STEM vs Technical	-3.27854	0.00122579	0.00367737	-0
	Science vs Technical	-1.96192	0.0530438	0.159131	-0
Human body	Non-STEM vs Science	-4.73021	3.87938e-06	1.16381e-05	-0
	Non-STEM vs Technical	1.37313	0.171213	0.513638	0
	Science vs Technical	4.61936	1.35719e-05	4.07158e-05	1
Animals and nature	Non-STEM vs Science	-3.75521	0.000218608	0.000655823	-0
	Non-STEM vs Technical	0.576566	0.564866	1	0
	Science vs Technical	2.92385	0.0044304	0.0132912	0
The environment	Non-STEM vs Science	-4.98225	1.22182e-06	3.66547e-06	-0
	Non-STEM vs Technical	-0.157728	0.874827	1	-0
	Science vs Technical	3.0563	0.00299433	0.008983	0
Technology in general	Non-STEM vs Science	-3.97027	9.55596e-05	0.000286679	-0
	Non-STEM vs Technical	-5.7309	3.53335e-08	1.06e-07	-
	Science vs Technical	-2.26493	0.0260608	0.0781825	-0
Science in general	Non-STEM vs Science	-9.59514	1.34373e-18	4.03118e-18	-
	Non-STEM vs Technical	-2.92378	0.00384681	0.0115404	-0
	Science vs Technical	4.17537	7.16623e-05	0.000214987	0
All interest combined	Non-STEM vs Science	-7.15324	1.07939e-11	3.23816e-11	-
	Non-STEM vs Technical	-3.38777	0.000844783	0.00253435	-0
	Science vs Technical	1.48703	0.140708	0.422124	0

Table A.10: Results for t-test on interest Vs first three choices of program.

	Pair	t statistic	P value	Cohen's d
Astronomy	Non-STEM vs STEM	-3.46778	0.000621791	-0.4493
Vehicles and engines	Non-STEM vs STEM	-2.272	0.0239723	-0.29437
Energyproduction	Non-STEM vs STEM	-6.68321	1.62033e-10	-0.865906
IT	Non-STEM vs STEM	-2.15676	0.0320182	-0.279439
Human body	Non-STEM vs STEM	-3.06338	0.00243821	-0.396905
Animals and nature	Non-STEM vs STEM	-2.9627	0.00335605	-0.383861
The environment	Non-STEM vs STEM	-4.57466	7.64989e-06	-0.592713
Technology in general	Non-STEM vs STEM	-5.67514	3.97898e-08	-0.735295
Science in general	Non-STEM vs STEM	-9.95476	9.13508e-20	-1.28978
All interest combined	Non-STEM vs STEM	-7.4975	1.25275e-12	-0.971408

Table A.11: Results from a logistic regression model on interest in various STEM topics vs first choice of program.

	coef	P-value	Odds-ratio
Astronomy Tech	0.034	0.873	1.035
Vehicles and engines Tech	0.925	< 0.01	2.522
Energyproduction Tech	0.889	< 0.01	2.431
IT Tech	0.6	0.012	1.822
Human body Tech	-0.178	0.395	0.837
Animals and nature Tech	-0.037	0.859	0.963
The environment Tech	0.054	0.806	1.056
Technology in general Tech	1.384	< 0.01	3.991
Science in general Tech	0.835	< 0.01	2.305
All interest combined Tech	1.707	< 0.01	5.514
Astronomy Science	0.669	< 0.01	1.952
Vehicles and engines Science	0.208	0.192	1.231
Energyproduction Science	0.919	< 0.01	2.506
IT Science	0.153	0.355	1.165
Human body Science	0.805	< 0.01	2.237
Animals and nature Science	0.57	< 0.01	1.768
The environment Science	0.765	< 0.01	2.148
Technology in general Science	0.695	< 0.01	2.004
Science in general Science	1.791	< 0.01	5.997
All interest combined Science	2.154	< 0.01	8.619

Table A.12: Results from a logistic regression model on interest in various STEM topics vs first three choices of program.

	coef STEM	P-value STEM	Odds-ratio STEM
Astronomy	0.504318	0.000568603	1.65586
Vehicles and engines	0.337397	0.0123188	1.4013
Energyproduction	0.920803	1.9773e-08	2.51131
IT	0.270962	0.0550978	1.31122
Human body	0.394378	0.0045561	1.48346
Animals and nature	0.362815	0.00734425	1.43737
The environment	0.596107	6.19164e-05	1.81504
Technology in general	0.73395	6.25299e-07	2.08329
Science in general	1.39709	3.12116e-13	4.04341
All interest combined	1.91925	1.41464e-09	6.81583

Table A.13: Difference in average of self-perception in STEM subjects as well as self-perceived effort it would require to do well in the different STEM programs for first choice of program.

	Science	Technical	Non-STEM	All
Mathematics	2.41379	2.13333	1.68831	1.91736
Biology	2.55172	2.03333	1.70779	1.95041
Physics	2.2069	1.96667	1.46104	1.70248
Chemistry	2.37931	2.03333	1.45455	1.74793
Technology	1.94828	2.16667	1.57792	1.73967
STEM combined	2.3	2.06667	1.57792	1.81157
Effort and tech.	2.24138	2.3	1.57143	1.82231
Effort and sci.	2.2069	1.56667	1.11688	1.43388
All self-efficacy	2.27833	2.02857	1.51113	1.75915

Table A.14: Difference in average of self-perception in STEM subjects as well as self-perceived effort it would require to do well in the different STEM programs for first three choices of program.

	Non-STEM	STEM	All
Mathematics	1.625	2.29245	1.91736
Biology	1.66176	2.32075	1.95041
Physics	1.44853	2.0283	1.70248
Chemistry	1.43382	2.15094	1.74793
Technology	1.59559	1.92453	1.73967
STEM combined	1.55294	2.1434	1.81157
Effort and tech.	1.55882	2.16038	1.82231
Effort and sci.	1.05147	1.92453	1.43388
All self-efficacy	1.48214	2.11456	1.75915

Table A.15: Results from a logistic regression model on self-perceived abilities vs first choice of program

	coef	P-value	Odds-ratio
Mathematics Tech	0.843	< 0.01	2.323
Biology Tech	0.835	< 0.01	2.304
Physics Tech	0.957	< 0.01	2.604
Chemistry Tech	1.291	< 0.01	3.638
Technology Tech	1.094	< 0.01	2.987
STEM combined Tech	1.752	< 0.01	5.764
Effort and tech. Tech	0.992	< 0.01	2.698
Effort and sci. Tech	0.691	< 0.01	1.995
All self-efficacy Tech	2.052	< 0.01	7.783
Mathematics Science	1.359	< 0.01	3.894
Biology Science	1.952	< 0.01	7.042
Physics Science	1.266	< 0.01	3.547
Chemistry Science	1.953	< 0.01	7.051
Technology Science	0.61	< 0.01	1.84
STEM combined Science	2.353	< 0.01	10.52
Effort and tech. Science	0.897	< 0.01	2.452
Effort and sci. Science	1.624	< 0.01	5.074
All self-efficacy Science	2.92	< 0.01	18.539

Table A.16: Results from a logistic regression model on self-perceived abilities vs first three choices of program

	coef	P-value	Odds-ratio
Mathematics	1.23656	3.84811e-09	3.44376
Biology	1.44697	2.89846e-10	4.25022
Physics	1.00521	6.94224e-08	2.73248
Chemistry	1.38035	3.12577e-10	3.9763
Technology	0.565431	0.00091366	1.76021
STEM combined	1.90804	3.39638e-11	6.73985
Effort and tech.	0.764438	1.68198e-06	2.14779
Effort and sci.	1.27486	2.80623e-11	3.57821
All self-efficacy	2.27791	2.47213e-12	9.75622

Appendix B

Survey

Undersökning av hur framtidsvisioner och självupplevd förmåga påverkar valet till gymnasiet (S1)

Du har nyss gjort ett val av vilken gymnasieskola du vill gå på och vilket program du vill läsa där. Innan terminen är slut kommer du göra ett slutgiltigt val när du verkligen bestämt dig, om du inte redan har gjort det. Det finns många skolor och program att välja och du väljer kanske delvis på grund av hur du själv ser på din framtid, alltså vad du vill göra när din skoltid äntligen är slut.

Ett val du eller dina klasskamrater har gjort är kanske att söka till det naturvetenskapliga eller det tekniska programmet på någon skola eller så väljer du något helt annat program. I den här enkäten kommer du få svara på några frågor om hur du själv ser på din egen framtid men också hur du ser på din egen förmåga och ditt intresse i Matematik och de olika NO ämnena.

Syftet med detta är att vi som forskar på unga människors studieval kan få större insikt i vad som påverkar om elever väljer, eller inte väljer, en naturvetenskaplig eller teknisk studieväg framåt.

Enkäten är helt anonym och frivillig. Det är den samlade informationen från många individers svar som är intressant för oss. Inga uppgifter som kan kopplas direkt till dig som person samlas in, endast vilken skola du läser på just nu. Enkäten borde inte ta mer än 10 minuter, men ta den tid du behöver.

Detta forskningsprojekt genomförs som ett examensarbete inom lärarutbildningen på Chalmers Tekniska Högskola, av Marcus Landahl.

Genom att svara på enkäten och lämna in godkänner du att vi använder datan för att analysera svaren.

Om du har några frågor, eller är intresserad av att ta del av resultaten av undersökningen är du välkommen att kontakta:
Ansvarig för studie: Marcus Landahl, Chalmers Tekniska Högskola (landahlm@chalmers.se)

1. Jag har tagit del av ovanstående information och ger mitt samtycke till att datan används i forskningssyfte. *

◯ Ja

Bakgrund

Några frågor om din bakgrund

2. Kön *

- ◯ Kille
- ◯ Tjej
- ◯ Vill inte svara
- ◯ Annat

3. Vad har din ena vårdnadshavare för utbildningsbakgrund? *

- ◯ Högst gymnasieexamen
- ◯ Högskoleutbildad (minst 3 år) men inte inom naturvetenskap eller teknik
- ◯ Högskoleutbildad (minst 3 år) inom naturvetenskap eller teknik
- ◯ Yrkesutbildad efter gymnasiet (1 eller 2 år) - t.ex. busschaufför, undersköterska m.m.
- ◯ Vet ej

4. Vad har din andra vårdnadshavare för utbildningsbakgrund? *

- Jag har bara en vårdnadshavare
- Högst gymnasieexamen
- Högskoleutbildad (minst 3 år) men inte inom naturvetenskap eller teknik
- Högskoleutbildad (minst 3 år) inom naturvetenskap eller teknik
- Yrkesutbildad efter gymnasiet (1 eller 2 år) - t.ex. busschaufför, undersköterska m.m.
- Vet ej

Intresse och förmåga

Här kommer några frågor om ditt intresse för naturvetenskap och teknik

5. För varje **skolämne** nedan ange hur intressant du tycker att ämnet är.
*

	Helt ointressant	För det mesta ointressant	Ganska intressant	Mycket intressant
Matematik	○	○	○	○
Biologi	○	○	○	○
Fysik	○	○	○	○
Kemi	○	○	○	○
Teknik	○	○	○	○

6. Hur intressant tycker du att följande ämnen är rent allmänt? Alltså antingen **i eller utanför** skolämnena. *

	Helt ointressant	För det mesta ointressant	Ganska intressant	Mycket intressant
Astronomi (t.ex. stjärnor planeter och galaxer)	○	○	○	○
Fordon och motorer (t.ex. bilar, båtar, raketer, flygplan)	○	○	○	○
Energisystem (t.ex. kärnkraft, solceller, bränslen, batterier)	○	○	○	○
IT (t.ex. Internet, sociala medier, datorprogram och artificell intelligens)	○	○	○	○
Människokroppen(t.ex. hälsa, virus, kost och träning, genetik)	○	○	○	○
Djur- och naturliv	○	○	○	○
Miljö (t.ex. klimatförändringar, väder, naturkatastrofer)	○	○	○	○

Teknik generellt	○	○	○	○
Naturvetenskap generellt	○	○	○	○

7. Hur duktig tycker du att du är på följande skolämnen? *

	Inte alls duktig	Inte speciellt duktig	Ganska duktig	Mycket duktig
Matematik	○	○	○	○
Biologi	○	○	○	○
Fysik	○	○	○	○
Kemi	○	○	○	○
Teknik	○	○	○	○

8. Hur mycket tid och ansträngning tror du det hade krävts av dig för att prestera bra på det tekniska programmet på en gymnasieskola? *

○ Jag hade nog inte klarat av det programmet

○ Väldigt mycket tid och stor ansträngning

○ Ganska mycket tid och ansträngning

○ Normalt mycket tid och ansträngning

9. Hur mycket tid och ansträngning tror du det hade krävts av dig för att prestera bra på det naturvetenskapliga programmet på en gymnasieskola? *

- ◯ Jag hade nog inte klarat av det programmet
- ◯ Väldigt mycket tid och stor ansträngning
- ◯ Ganska mycket tid och ansträngning
- ◯ Normalt mycket tid och ansträngning

10. Allmänna påståenden relaterade till framtidsvisioner. *

	Håller inte alls med	Håller inte med speciellt mycket	Håller delvis med	Håller med helt och hållet
Det är värt 3 eller 5 år av högskolestudier för att uppnå mina mål	◯	◯	◯	◯
Oavsett område för fortsatta studer har jag nytta av kunskap i naturvetenskap och teknik	◯	◯	◯	◯
De som arbetar med naturvetenskaplig forskning är viktiga för samhället.	◯	◯	◯	◯
Teknologisk uteckling är huvudsakligen positiv för samhället.	◯	◯	◯	◯

Din framtid och vad du tycker är viktigt

I de två nedanstående frågorna ska du sortera svaren genom att rangordna så det du tycker är viktigast hamnar längst upp och fortsätt tills det du tycker är minst viktigt hamnar längst ner.

11. När du är klar med skolan och kommer ut i arbetslivet, vad är viktigast? *

- Att bli känd
- Hjälpa människor
- Att göra samhällsnytta - Alltså bidra till att samhället blir bättre för alla människor.
- Mycket fritid
- Att det är ett roligt jobb
- Social status - t.ex. bli högt uppsatt chef eller politiker
- Tjäna mycket pengar
- Personlig utveckling - Alltså att lära sig nya saker, får bättre förståelse av olika saker eller bli bättre på olika förmågor osv.

12. När du är klar med skolan och ska ut i arbetslivet vilka typer av uppgifter vill du helst arbeta med? *

- Arbeta för att hjälpa djur och/eller naturen/miljön
- Arbeta med händerna, alltså praktiska uppgifter
- Leda människor och ta viktiga beslut
- Forska och upptäcka
- Kreativitet / skapande (musik, film, littteratur, konst etc.)
- Socialt arbete - Alltså att arbeta tillsammans med människor för att lösa uppgifter och problem.
- Lösa tekniska problem
- Hjälpa människor
- Göra affärer - alltså köpa/sälja produkter och tjänster

Yrkesval

Vilket typ av yrke eller sysselsättning vill du helst ha efter skolan? Skriv ett ord för yrke 1 och ett ord för yrke 2. T.ex. Ingenjör, hantverkare, youtuber, fotograf, brandman, jurist osv. Yrke 1 är det du mest av allt vill jobba med och yrke 2 är ditt andra alternativ.

13. Yrke 1 *

14. Yrke 2 *

Ditt val till gymnasiet

I denna sista fråga ska du skriva det gymnasieprogram som du har valt eller ska välja. Svara kortfattat, helst med ett ord t.ex. Naturprogrammet, Industriprogrammet, Samhällsprogrammet, Teknikprogrammet, Ekonomiprogrammet, Frisörprogrammet, Byggprogrammet, Estetiska programmet etc.).

15. Vad är ditt första val till gymnasiet? *

16. Vad är ditt andra val till gymnasiet? *

17. Vad är ditt tredje val till gymnasiet? *

Tack för att du har genomfört enkäten och hjälpt forskningen på det här området. Lycka till med allt och ta hand om varandra.

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