CHALMERS
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Exploring Factors Impacting Engineering Identity Among Students

A Quantitative Survey Study Conducted at Chalmers University of Technology

Master's thesis in Learning and Leadership

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DEPARTMENT OF COMMUNICATION AND LEARNING IN SCIENCE

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Abstract

We are living in a society where products and services are becoming more complex which implies that jobs require a deeper understanding and higher level of competence. Over time the social and cultural expectation in pursuing higher education has also changed where many younger people are encouraged to pursue higher education as it is known to increases personal and economical success and stability. In Sweden and other countries, concerns are often raised about the number and trajectories of students enrolled in engineering education.

In research on engineering education, engineering identity has become a central concept for understanding students' relations to engineering. This refers to how individuals see themselves as engineers and involves the internalization of the roles, skills, and values associated with the engineering profession. Fostering a strong engineering identity among students can make a positive impact on future engineering workforce, enhance the country's technical knowledge and its global competitiveness.

For this study, a survey was conducted with 359 students enrolled in their first to third academic year at Chalmers University of Technology. The aim of the study was to identify the factors that shape the students' engineering identity and influence their choice of engineering program at Chalmers. The results suggests that the engineering students' background, field of study, gender, and year of study does have an influence on their relationship to engineering. A key finding in this study was the correlation between students with at least one parent with STEM background and their self perception of engineering identity, where it was found that students with parental STEM background had stronger engineering identity and sense of belonging in the field. This implies that universities need to enhance inclusion strategies and develop relation to engineering for all students, regardless of their background. Future research suggestions based on these findings are presented in the discussion and analysis chapter.

Keywords: engineering identity, stem, statistical data analysis, spss, independent two-sample t-test, anova.

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Introduction

1.1 Background

We are living in a society where products and services are becoming more complex, which implies that jobs require a deeper understanding and higher level of competence. Over time, the social and cultural expectation in pursuing higher education has also changed where many younger people are encouraged to pursue higher education in order to increase personal and economical success and stability.

Every year students must make an important decision of making the right academic educational choice. The choice does not only include aspirations for a career but also for students' self-development and sense of identity. At a technical university, an important aspect of this identity formation is the development of an engineering identity. This refers to how individuals see themselves as engineers and involves the internalization of the roles, skills, and values associated with the engineering profession.

In Sweden, studying engineering programs has become increasingly popular in recent years, although the percentage of students who fully complete their education is falling. This will result in a shortage of engineers by the year 2030 of approximately 50 000 engineers according to statistics from SCB (2013). For Sweden to continue competing in the innovational global stage requires a lot more individuals with STEM (Science, Technology, Engineering, and Mathematics) background. Therefore, the Swedish Government has in the budget proposition for the year of 2024 proposed to include more resources to create more opportunities for future engineers in Sweden. The Swedish government is aiming to do changes for the whole educational system starting from pre-school to implement a STEM-strategy to raise the future students' interest in STEM-subjects (Swedish Government, 2023).

However, recruiting more engineering students is not an easy task. Engineering programs are well known for being difficult and demanding. According to a report by the Swedish Higher Education Authority (UKÄ) (2017), which observed graduation rates and dropout rates in technical and engineering programs in Sweden, statistics revealed that more than half of those who begin these programs do not complete them and obtain a degree.

Chalmers University of Technology is a popular choice when it comes to pursuing higher education in STEM programs. Chalmers currently has around 10 000 students and a staff of 3000 employees based in two campuses (Johanneberg and Lindholmen) in Sweden's second largest city Gothenburg (Studentum, 2019). The bachelor programs tend to have many students coming from different parts of Sweden, while the master's programs tend to have a mix between national and international students.

Recent research has shown that the development of engineering identity is affected by various factors, such as background and gender. Therefore it is interesting given the societal needs and previous research to investigate how students at Chalmers are affected (Godwin et al., 2016).

1.2 Aim

The primary aim of this thesis is to research the factors that shape the engineering identity of students and influence their choice of engineering program at Chalmers University of Technology. This study seeks to understand the complex interplay between students' background, field of study, gender, year of study, and personal interests, and how these elements contribute to their relation to engineering and their choice of engineering program. The findings of this thesis could have significant implications for educational practices at Chalmers and other technical institutions.

In this study, the term 'relationship to engineering' is conceptualized through three distinct aspects: engineering identity, preferred engineering field, and factors influencing career satisfaction.

1.2.1 Research Questions

The questions that will be addressed through the survey are as following:

- How do the engineering students' background, field of study, gender, and year of study influence their relationship to engineering?

- How do personal interests and passions impact the choice of engineering program among students?

2

Previous Research

In this chapter, existing research relevant to the studied area will be given. This is provided to create a context with the research in this thesis regarding educational background and existing knowledge about engineering identity.

2.1 Engineering Identity

For an engineering student it is important to develop an engineering identity for its own acceptance and recognition of its field. This is important for the student's willingness to enter and stay in the engineering field after getting a degree (Ju & Zhu, 2023). The process of becoming an engineer is typically an identity development process over a long period of time. In the study "Understanding engineering identity in undergraduate students" by Hughes et al. (2018), it was shown that students who identify as engineers are much more likely to graduate, therefore it is important to provide opportunities for students to get the chance to interact with their peers, faculty and industry mentors to develop an engineering identity.

According to Godwin et al. (2016), engineering identity has a significant impact on whether students persist in engineering education and careers. The identity is usually formed during their undergraduate years, particularly within the engineering community of practice where they gain experiences. According to the research, the identity is shaped by three main constructs: the students' interest in the subject, students feeling of recognition by others, and students' beliefs about their performance/competence in the subject area.

It is seen that recognition plays a significant part in the identity development. A student's view of how others view him or her is extremely important to how that student views himself or herself. This phenomenon has been seen in studies that show how female students in elite engineering programs who show great skill in engineering but were not recognized by their peers and professors had weaker engineering identity and did not feel like they fitted in the engineering field (Godwin et al., 2016).

Additionally, the students' own interest in engineering is a powerful motivator in learning and career choice. When a student is interested in something with passion it can motivate them to dive deeper into complex engineering concepts and give them willingness to spend time on engineering projects. The same goes for the student's self-perception of their abilities in engineering, if they feel like they are able to apply their theoretical knowledge to practical use it gives them a confidence boost, resulting in them being able to tackle more difficult engineering problems.

According to Lakin et al. (2020), the first year of engineering programs is the most crucial time for students to develop their engineering identity. This is the period when students begin to see themselves as future engineers and start to understand what it means to be a professional in the field.

The authors also suggest that engineering education programs should adapt to a more modern view of engineering identity. This could mean incorporating more real-world applications and current industry practices into the curriculum. This would present a learning environment that encourages creativity and innovation, where students could engage in hands-on projects and collaborative work. This would result in students not only learning the technical skills necessary for their field, but also gaining a sense of belonging and commitment to the engineering profession.

It is not uncommon for engineering students to feel like they aren't "real" engineers, sometimes persisting even post-graduation. There are many reasons why this feeling might appear. One such factor could be the student's motivation for selecting an engineering program, which might be driven by the prospective benefits and wealth associated with engineering, rather than a genuine passion for STEM and problem-solving within the engineering field. Therefore it is important to understand the factors that influence the development of an engineering identity.

2.2 Factors Influencing Student Program Choice

The engineering field has always been a traditionally male-dominated field. Studies show that male and female engineering students may have different perceptions and experiences when it comes to their preferred career path and workforce.

A Danish study investigated gender differences in engineering students' understanding of professional competences and career development during the transition from education to work. The study was based on a longitudinal survey conducted from 2010 to 2016 and it was investigated how one year in the workforce impacts young engineers' perceptions of engineering work and its importance for career development (Chen et al., 2023). It was found that male engineering students usually are more confident in their technical skills and abilities, compared to females. Male engineering students seem to prefer work that require independence, risk-taking and entrepreneurship. This results in male students feeling like they can achieve more challenging engineering problems, thus in their future profession in the area even be more likely to pursue leadership roles within the field.

Additionally, it was shown that women in engineering prioritizes factors like societal and environmental values, communication, and teamwork. They tended to care more about the environmental impact and social responsibility of the engineering work compared to the male engineers. It was also shows that women tend to value jobs with higher security and stability over starting their own businesses. This differs from male engineering students that were more willing to start up their own company.

Moreover, it is evident that there were differences in the way last year students compared to graduates that had been working for a year viewed the importance of factors like having a job that compensates the employee sufficiently and the possibility to contribute scientifically to the workplace. Similar differences in the profiles of men and women in engineering education has been documented in Sweden (Engström, 2018).

2.3 Parental Educational Background and Student Choices

Parental role models are often the reason children tend to pursue a career much alike their parents. This implies that the parents educational background is a significant influencing factor in the students' future academic and career choices.

There are many studies that highlight the direct impact of the parental educational background when it comes to students' decision in pursuing a specific academic path. The research shows that students often get inspired by their parent's educational journey and tend to go down a similar path themselves (Haveman & Smeeding, 2006). The similarities between parents' and children's choices can show up in different ways, for example the decision to attend university, or even specifically selecting the same-sector major. According to a study done by Dryler (1998), the "same-sector effect" tended to be stronger for fathers and sons than mothers and daughter.

Additionally, parental expectations have been identified as a significant factor influencing children's academic and career choices. Parents with higher levels of education often have high expectations for their children's educational trajectories and future professions (Pinquart & Ebeling, 2020). These expectations can be presented in various forms, such as encouraging children to pursue advanced courses, providing resources for additional learning, or setting high standards for academic performance.

The impact of parent's educational background on students' choices is not only influenced by socioeconomical factors but also the influence of cultural values. Cultural values do differ a lot in different parts of the world. In Sweden individualism is a typical cultural trait that is greatly encouraged into Swedish students to develop their independence and to think critically. This thinking tends to promote a cultural trait where the students have the opportunity to choose their own educational path that fits their personal interest the most (Säljö, 2010).

3

Methods

In this chapter, the methods used in the study are presented. This includes the research design, sampling and data collection procedures, and the various techniques used for data analysis.

3.1 Research Design

A survey was designed to collect data from students for this study, see Appendix C. The survey was divided into two sections. The first part included questions that focused on the students' background and educational choices, while the second part of the survey included questions that focused on the students' view on being an engineering student at Chalmers. This was done to get a deeper insight into their perception of their personal engineering identities, where traits and patterns can be analyzed.

Upon entering the survey, participants were provided with a brief description of the survey's purpose and the nature of the research. To maintain transparency, information such as the approximate time the survey would take was provided. The survey was designed to be fully anonymous and confidential, ensuring that it would be impossible to identify any student who participated in the survey. If participants had any questions regarding the survey, they had the option to contact the researcher via email.

When designing a survey, it is important to keep the participants interest throughout the whole survey-taking process. Therefore, it is very important that the survey has a good structure and questions that are easy to understand for the participants. If the survey is too long or complicated, participants with a short attention span may choose to opt out of the survey or quickly click though the answers for the questions without even reading what is asked, which can result is less accurate data. This was taken into consideration resulting in a survey that was designed with clear and concise questions that were easy to understand (Ponto, 2015).

A pilot study was conducted to ensure the quality of the survey. This was done by having five individuals test the survey. During this test, it was discovered that the use of Microsoft Forms was not optimal for questions with a Likert scale when answered on a mobile phone, as participants had to scroll horizontally to view all five response options. Therefore, all questions were transferred from Microsoft Forms to Google Forms, where the Likert scales were better adapted for responses from a mobile phone.

The design of the survey questions was grounded in prior research in the field, including aspects such as parental background and career satisfaction. Specifically, the questions regarding engineering identity were inspired by similar ones used in a previous paper "The Development of a Measure of Engineering Identity" by Godwin (2016). This approach was taken to ensure that the survey was relevant in the context of this study about engineering identity.

Additionally, the questions were designed in a way that makes it easy to conduct statistical analysis. The survey contained multiple-choice questions and questions using the Likert scale which is commonly used to get scaling responses in survey research, see Appendix C. Likert scaling is a bipolar scaling method where both positive and negative responses are measured. The format of a typical Likert scale is five levels, ranging from “Strongly disagree” to “Strongly agree” (Elliott, 2021).

3.2 Sampling and Data Collection

The survey is targeted to students enrolled at Chalmers University within their first to third academic year of the program. For students in the first three years of their program there were 6459 email addresses registered for an email dispatch, see Appendix D. The survey was designed using Google Forms. The survey had a 3-week time frame to collect responses. If the participation rate was low there was a possibility to send out an extra reminder email but this was not needed in this study. At the end of this period, a total of 359 valid responses were collected and were used for further analysis.

There are potential biases when using this sampling method. Since participation was voluntary, there may be a self-selection bias since students who chose to respond might have different characteristics or opinions compared to non-respondents (Bethlehem, 2010). This means that the sample may not accurately represent the entire student population and instead include the more engaged students, leading to a skewed representation of viewpoints.

3.3 Data Analysis

Data analysis in research aims to identify patterns and draw meaningful conclusions from the data. In this study, several statistical methods have been used with the aim to understand the difference between various groups such as gender, high school program, background and finding possible correlations and significant differences between the groups.

In this study, the program IBM SPSS Statistics was used when the statistical analysis was performed.

3.3.1 Pre-processing

Before the data could be utilized for analysis, it underwent a preparation process. The collected raw data from the Google Forms survey was exported to an Excel file. The data needed to be converted into numerical format to enable statistical analysis in SPSS.

The Likert scale responses, ranging from “Strongly Disagree” to “Strongly Agree”, were transformed into ordinal variables on a scale of 1 to 5. The high school programs were categorized into three groups: Natural Sciences, Technology, and Others. These were converted into nominal variables given the values 1, 2, and 3 respectively. The genders (male/female) were converted to the nominal variables 1 and 2.

The academic programs at Chalmers were categorized into the following six groups: 1. Technical and Natural Sciences, 2. Information and Communication Technology, 3. Engineering and Industrial Design, 4. Business and Management, 5. Civil and Architectural Engineering, and 6. Other Programs. This categorization was based on the nature of the programs and was done to facilitate the analysis of the program fields. The details of this categorizing can be found in Appendix B.

However, due to a low number of participants from the sixth group (Other Programs), see Appendix B.6, this group was not included in the main analysis. The small sample size in this group could potentially limit the reliability of the results, therefore it was decided to exclude this group from the primary analysis, see Table A.16 in Appendix.

3.3.2 Descriptive Statistics (Cross-tables)

In this study, descriptive statistics were to summarize and organize the characteristics of a dataset. Data can be presented in many ways, and one effective method for presenting nominal data is with a cross-table. The key advantage of a cross-table is its ability to reveal patterns within the data that may not be immediately apparent. A cross-table provides an initial overview of how the data is distributed among different categories, and includes the mean and standard deviation for each category. The standard deviation is a measure of how much the values deviate from the mean and is crucial for understanding the spread or variability of the data. A larger standard deviation suggests greater variability or dispersion.

Additionally, the cross-tables show the standard error of the mean, which is a statistic for measuring the accuracy of the sample mean as an estimate for the population mean. It is calculated as the standard deviation divided by the square root of the sample size:

$$\text{Std. Error Mean} = \frac{\text{Std. Dev.}}{\sqrt{n}}$$

The standard error provides insight into the reliability of the mean, where a smaller standard error indicates a more reliable mean estimate. Therefore, cross-tables are particularly useful when the data involves multiple categories and when the variability within these categories is of interest.

3.3.3 Statistical Hypothesis Testing

In this subsection the statistical methods used for this study are presented. Each statistical method will be briefly described along with how each statistical method has been applied to interpret the results.

3.3.3.1 Significance and P-value

In statistical analysis, p-value is the key concept when testing statistical hypotheses. The p-value measures the strength of the evidence against the null hypothesis. The null hypothesis is an assumption that there is no significant difference between the populations that are considered.

A p-value ranges between 0 and 1. In this research a significance level (α) were set at the typical level 0.05, indicating a willingness to accept a 5% of chance of incorrectly rejecting the null hypothesis. This means that if the p-value is less than or equal to 0.05, the results are considered statistically significant (McLeod, 2023).

3.3.3.2 Independent Two-Sample T-Test

The Independent Two-Sample T-Test, also known as the Independent t-test, is a statistical procedure that compares the means of two independent groups to determine if there is a statistically significant difference between them. This test is commonly used in research when the goal is to compare the means of two groups under different conditions.

The test works by calculating a t-statistic, which is the ratio of the difference between the two group means and the variability of the two groups. The formula for the t-statistic in an independent two-sample t-test is:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{s_p \cdot \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

where:

- $\bar{X}_1$ and $\bar{X}_2$ are the sample means of group 1 and group 2, respectively.
- s_p is the pooled standard deviation.
- n_1 and n_2 are the sizes of group 1 and group 2, respectively.

The calculated t-statistic is then compared to a critical value from the t-distribution table with degrees of freedom $df = n_1 + n_2 - 2$. In this study, the one-tailed t-test was used, which means that we are only testing for an increase or a decrease in one direction. If the absolute value of the t-statistic is greater than the critical value, we reject the null hypothesis and conclude that there is a significant difference between the group means.

In this study, the Independent t-test was used to investigate potential differences between various groups like genders. The null hypothesis in that case would be that there is no significant difference between the means of the two genders for the variable under investigation. If the p-value associated with the calculated t-statistic is less than the significance level (0.05 in this study), the null hypothesis is therefore rejected, indicating a significant difference between genders.

3.3.3.3 Analysis of Variance (ANOVA)

Analysis of Variance (ANOVA) is a statistical method used to test differences between the means of three or more groups. Unlike the t-test, which is used for comparing the means of two groups, ANOVA is designed to compare the means of three or more groups.

ANOVA works by analyzing the variance in the data. It separates the total variability within a data set into two components: random and systematic factors. The total variance is partitioned into components attributable to different sources of variation.

The formula for the F-statistic in ANOVA is:

$$F = \frac{\text{Between-group variance}}{\text{Within-group variance}}$$

where:

- Between-group variance is the sum of the squared differences between the group mean and the overall mean, divided by the degrees of freedom.

- Within-group variance is the sum of the squared differences between each observation and its group mean, divided by the degrees of freedom.

The calculated F-statistic is then compared to a critical value from the F-distribution table with degrees of freedom determined by the number of groups and the total sample size. If the F-statistic is greater than the critical value, we reject the null hypothesis and conclude that there is a significant difference between the group means.

3.3.4 Effect Sizes in Statistical Hypothesis Testing

Effect size is a crucial measure in statistical analysis, particularly when comparing two independent groups. It indicates the magnitude of this difference between these groups. Effect size thus provides a measure of the practical significance of research findings, indicating the degree of significance of the relationship between variables and the differences between groups.

3.3.4.1 Cohen's *d*

One commonly used measure of effect size for independent samples is Cohen's d. Cohen's d is calculated by taking the difference between two group means and dividing it by the pooled standard deviation of the data. The formula for Cohen's d is:

$$d = \frac{\text{Mean of Group A} - \text{Mean of Group B}}{\text{Pooled Standard Deviation}}$$

Cohen (1977) suggested the following interpretations for different values of d:

- Small effect size: $d \approx 0.2$
- Medium effect size: $d \approx 0.5$
- Large effect size: $d \approx 0.8$

A large value of Cohen's d indicates a substantial difference between the group means, while a small value suggests limited practical implications of the data.

3.3.4.2 Eta-squared

In the context of ANOVA models, Eta-squared is often used to measure the effect size. Eta-squared values range from 0 to 1. The interpretations of Eta-squared values, as suggested by Cohen (1988), are as follows:

- Small effect size: 0.01
- Medium effect size: 0.06
- Large effect size: 0.14 or higher

A low Eta-squared value indicates that the magnitude of the relationship is relatively modest, even if there is statistical significance. Conversely, a high Eta-squared value indicates a large effect size. This underscores the importance of considering both statistical significance and effect size in the interpretation of research findings.

4

Results

In this chapter, the results of the study are presented. The findings are are based on statistical analyses, including t-tests and ANOVA. Cross-tables with mean values are included to present a detailed view of the data. The effect sizes are included in Appendix A. These results form the basis for the discussions and conclusions that follow.

4.1 Gender

In this section, a cross table of the means and the results of the t-test are presented of the variable gender and their relationship to engineering.

4.1.1 Engineering Identity

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
I feel like an engineer right now	Male	217	2,83	1,135	,077
	Female	136	2,35	1,111	,095
I believe I will feel like an engineer in the future	Male	217	4,12	1,014	,069
	Female	136	3,97	1,122	,096
I see myself as an engineer	Male	217	3,20	1,210	,082
	Female	136	2,76	1,164	,100
My parents see me as an engineer	Male	217	3,51	1,085	,074
	Female	135	3,30	1,153	,099
I enjoy learning more about the engineering subjects	Male	217	4,35	,896	,061
	Female	136	4,07	,896	,077
I feel that I belong in the field of engineering	Male	217	3,92	1,075	,073
	Female	135	3,45	1,183	,102
I feel that I understand the courses I am taking	Male	216	4,00	,952	,065
	Female	136	3,74	,888	,076
I can perform well in my exams	Male	217	3,88	1,078	,073
	Female	136	3,85	,868	,074
Others come to me regarding engineering questions	Male	217	3,32	1,070	,073
	Female	136	2,99	1,102	,095

Table 4.1: *Cross table of gender differences in engineering identity*

Independent Samples Test

	t-test for Equality of Means						
	t	df	Significance P-value	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
I feel like an engineer right now	3,97	351	<,001	,489	,123	,246	,731
I believe I will feel like an engineer in the future	1,25	351	,212	,145	,116	-,083	,372
I see myself as an engineer	3,38	351	<,001	,441	,130	,184	,697
My parents see me as an engineer	1,73	350	,085	,211	,122	-,029	,450
I enjoy learning more about the engineering subjects	2,90	351	,004	,284	,098	,091	,477
I feel that I belong in the field of engineering	3,84	350	<,001	,470	,122	,229	,711
I feel that I understand the courses I am taking	2,56	350	,011	,260	,102	,060	,460
I can perform well in my exams	,316	351	,753	,035	,110	-,181	,250
Others come to me regarding engineering questions	2,85	351	,005	,337	,118	,104	,570

Table 4.2: *Result of independent two-sample t-test for gender differences in engineering identity*

The group statistics (See Table 4.1) revealed that male students generally reported higher mean scores than female students in most measures of engineering identity.

Male students reported feeling more like an engineer than female students, with a significant difference in means ($p < .001$). Similarly, male students were more likely to see themselves as engineers, with a significant difference observed ($p < .001$).

While both genders believed they would feel like an engineer in the future, the difference was not statistically significant ($p = .212$). The same was true for the perception of their parents seeing them as engineers ($p = .085$), and their belief in their ability to perform well in exams ($p = .753$).

Male students reported enjoying learning about engineering subjects more than female students, with a significant difference ($p = .004$). They also felt a stronger sense of belonging in the field of engineering ($p < .001$), and believed they understood their courses better than female students ($p = .011$). Male students were also more likely to be approached for engineering questions, with a significant difference ($p = .005$).

4.1.2 Engineering Fields

Group Statistics

	Kön	N	Mean	Std. Deviation	Std. Error Mean
Sustainable Development	Male	215	3,36	1,234	,084
	Female	136	4,01	1,132	,097
The industry	Male	215	3,69	1,097	,075
	Female	137	3,26	1,052	,090
Research	Male	214	3,59	1,166	,080
	Female	137	3,46	1,219	,104
International work	Male	212	3,53	1,137	,078
	Female	137	3,62	1,201	,103
Production	Male	212	3,33	1,163	,080
	Female	137	3,18	1,119	,096
Product development	Male	213	3,77	1,093	,075
	Female	137	3,68	1,200	,103
Technical work	Male	212	3,99	,976	,067
	Female	137	3,41	1,108	,095
Economics/Management	Male	213	2,98	1,392	,095
	Female	137	2,69	1,338	,114

Table 4.3: *Cross table of gender differences in preferred engineering fields*

Independent Samples Test

	t-test for Equality of Means						
			Significance			95% Confidence Interval of the Difference	
	t	df	P-value	Mean Difference	Std. Error Difference	Lower	Upper
Sustainable Development	-4,921	349	<,001	-,645	,131	-,902	-,387
The industry	3,644	350	<,001	,430	,118	,198	,662
Research	1,029	349	,304	,134	,130	-,122	,389
International work	-,686	347	,493	-,087	,127	-,338	,163
Production	1,213	347	,226	,152	,126	-,095	,399
Product development	,770	348	,442	,096	,124	-,149	,340
Technical work	5,112	347	<,001	,577	,113	,355	,799
Economics/Management	1,934	348	,054	,290	,150	-,005	,586

Table 4.4: *Result of independent two sample t-test for gender differences in preferred engineering fields*

The results showed significant differences in the fields of Sustainable Development ($p < 0.001$), The Industry ($p < 0.001$), and Technical Work ($p < 0.001$). This implies that the gender differences in these fields are statistically significant.

However, for fields Research, International Work, Production, and Product Development, showed no significant difference between the genders ($p > 0.05$).

4.1.3 Factors Influencing Career Satisfaction

Group Statistics

	Kön	N	Mean	Std. Deviation	Std. Error Mean
Salary and benefits	Male	214	4,27	,806	,055
	Female	137	4,38	,583	,050
Become famous	Male	214	1,89	,996	,068
	Female	136	1,54	,708	,061
Help other fellow human beings	Male	214	3,71	1,056	,072
	Female	136	4,10	,961	,082
Work with people	Male	214	3,35	1,223	,084
	Female	137	3,57	1,097	,094
Lead people	Male	214	3,06	1,151	,079
	Female	137	3,09	1,006	,086
Invent/design things	Male	213	3,75	1,027	,070
	Female	137	3,30	1,197	,102
Development opportunities within the job	Male	212	4,27	,844	,058
	Female	137	4,42	,672	,057
To develop new knowledge and skills	Male	214	4,43	,770	,053
	Female	137	4,50	,719	,061
Having a good balance between work life and leisure	Male	214	4,44	,880	,060
	Female	136	4,80	,499	,043

Table 4.5: *Cross table of gender differences for factors influencing career satisfaction*

Independent Samples Test

	t-test for Equality of Means						
						95% Confidence Interval of the Difference	
	t	df	Significance P-value	Mean Difference	Std. Error Difference	Lower	Upper
Salary and benefits	-1,364	349	,173	-,109	,080	-,265	,048
Become famous	3,500	348	<,001	,344	,098	,151	,537
Help other fellow human beings	-3,468	348	<,001	-,388	,112	-,608	-,168
Work with people	-1,738	349	,083	-,224	,129	-,476	,029
Lead people	-,284	349	,776	-,034	,120	-,270	,202
Invent/design things	3,763	348	<,001	,452	,120	,216	,688
Development opportunities within the job	-1,750	347	,081	-,150	,086	-,318	,019
To develop new knowledge and skills	-,809	349	,419	-,066	,082	-,228	,095
Having a good balance between work life and leisure	-4,317	348	<,001	-,358	,083	-,520	-,195

Table 4.6: *Result of independent two-sample T-test for gender differences and factors influencing career satisfaction*

The results from the t-test showed significant differences between males and females in several factors. The p-values for 'Become famous', 'Help other fellow human beings', 'Invent/design things', and 'Having a good balance between work life and leisure' were all less than 0.001.

However, the factors 'Salary and benefits', 'Work with people', 'Lead people', 'Development opportunities within the job', and 'To develop new knowledge and skills' did not show significant differences between the genders ($p > 0.05$).

4.2 Current Year in Program and Engineering Identity

In this section, a cross table of the means and the results of the ANOVA tests are presented of the variable current year in program and their enigineering identity.

Report

	Läsår											
	1			2			3			Total		
	Mean	N	Std. Dev.	Mean	N	Std. Dev.	Mean	N	Std. Dev.	Mean	N	Std. Dev.
I feel like an engineer right now	2,34	128	1,10	2,61	105	1,09	2,94	114	1,19	2,62	347	1,2
I believe I will feel like an engineer in the future	4,15	128	1,02	4,10	105	,986	3,91	114	1,18	4,05	347	1,1
I see myself as an engineer	2,81	128	1,19	3,06	105	1,16	3,20	114	1,27	3,01	347	1,2
My parents see me as an engineer	3,25	128	1,09	3,43	105	1,12	3,58	113	1,14	3,41	346	1,1
I enjoy learning more about the engineering subjects	4,30	128	,759	4,28	105	,860	4,09	114	1,08	4,22	347	,91
I feel that I belong in the field of engineering	3,79	127	1,07	3,74	105	1,14	3,67	114	1,21	3,73	346	1,1
I feel that I understand the courses I am taking	3,89	128	,933	3,89	105	,902	3,85	114	1,01	3,88	347	,95
I can perform well in my exams	3,80	128	,997	3,89	105	,984	3,85	114	1,09	3,84	347	1,0
Others come to me regarding engineering questions	3,21	128	1,17	3,07	105	,993	3,31	114	1,11	3,20	347	1,1

Table 4.7: *Cross table of differences between current year in program and engineering identity*

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
I feel like an engineer right now	Between Groups	21,351	2	10,676	8,415	<,001
	Within Groups	436,436	344	1,269		
	Total	457,787	346			
I believe I will feel like an engineer in the future	Between Groups	3,610	2	1,805	1,590	,205
	Within Groups	390,350	344	1,135		
	Total	393,960	346			
I see myself as an engineer	Between Groups	9,411	2	4,706	3,228	,041
	Within Groups	501,517	344	1,458		
	Total	510,928	346			
My parents see me as an engineer	Between Groups	6,733	2	3,367	2,716	,068
	Within Groups	425,166	343	1,240		
	Total	431,899	345			
I enjoy learning more about the engineering subjects	Between Groups	3,236	2	1,618	1,979	,140
	Within Groups	281,230	344	,818		
	Total	284,467	346			
I feel that I belong in the field of engineering	Between Groups	,887	2	,444	,342	,710
	Within Groups	444,650	343	1,296		
	Total	445,538	345			
I feel that I understand the courses I am taking	Between Groups	,109	2	,055	,061	,941
	Within Groups	309,562	344	,900		
	Total	309,671	346			
I can perform well in my exams	Between Groups	,386	2	,193	,184	,832
	Within Groups	361,211	344	1,050		
	Total	361,597	346			
Others come to me regarding engineering questions	Between Groups	3,187	2	1,594	1,317	,269
	Within Groups	416,092	344	1,210		
	Total	419,280	346			

Table 4.8: *Result of ANOVA test for differences between current year in program and engineering identity*

There is a significant difference in students' current and future identification with the engineering profession as they progress through their academic years ($p < 0.05$). However, their future professional identity remains consistent across the years indicating that they believe they will feel like engineers in the future ($p > 0.05$).

Similarly, students' sense of belonging, understanding of their courses, performance in exams, and being approached by others for engineering questions also remain consistent throughout their academic journey ($p > 0.05$). The F-values are presented in Table 4.8.

4.3 Field of Study

In this section, a cross table of the means and the results of the ANOVA tests are presented of the variable field of study and their personal interest and passion, engineering identity, preferred engineering fields and factors influencing career satisfaction.

4.3.1 Personal Interest and Passion

Report

Personal interest

Field of study	Mean	N	Std. Deviation
Technical and Natural Sciences	4,34	122	,831
Information and Communication Technology	4,31	52	,701
Engineering and Industrial Design	4,35	82	,822
Business and Management	4,03	38	,854
Civil and Architectural Engineering	3,95	58	1,016
Total	4,24	352	,858

Table 4.9: *Cross table presenting score of personal interest and passion*

ANOVA

Personal interest

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9,294	4	2,324	3,236	,013
Within Groups	249,180	347	,718		
Total	258,474	351			

Table 4.10: *Result of ANOVA test of field of study groups and their personal interest and passion*

The ANOVA test shows that there is a significant difference in how students in different field of study rate the importance of their personal interest and passions for choosing their selected program (p = 0.013). The F-value are presented in Table 4.10.

4.3.2 Engineering Identity

Report

Field of study		I feel like an engineer right now	I believe I will feel like an engineer in the future	I see myself as an engineer	My parents see me as an engineer	I enjoy learning more about the engineering subjects	I feel that I belong in the field of engineering	I feel that I understand the courses I am taking	I can perform well in my exams	Others come to me regarding engineering questions
Technical and Natural Sciences	Mean	2,81	4,18	3,16	3,50	4,29	3,69	3,75	3,59	3,15
	N	122	122	122	122	122	122	122	122	122
	Std. Dev.	1,131	,927	1,116	1,062	,744	1,092	,984	1,112	1,148
Information and Communication Technology	Mean	2,81	4,08	3,12	3,52	4,44	4,10	4,14	4,19	3,37
	N	52	52	52	52	52	52	51	52	52
	Std. Dev.	1,221	,967	1,263	1,038	,669	,891	,749	,768	,991
Engineering and Industrial Design	Mean	2,67	4,40	3,20	3,51	4,44	4,11	3,77	3,82	3,41
	N	82	82	82	81	82	82	82	82	82
	Std. Dev.	1,112	,859	1,222	1,131	,833	,994	1,010	1,090	1,077
Business and Management	Mean	2,16	3,21	2,42	3,03	3,74	2,84	4,24	4,21	2,95
	N	38	38	38	38	38	38	38	38	38
	Std. Dev.	1,027	1,436	1,200	1,262	1,155	1,366	,675	,664	1,161
Civil and Architectural Engineering	Mean	2,32	3,84	2,75	3,26	4,11	3,63	3,98	4,04	3,04
	N	57	57	57	57	57	56	57	57	57
	Std. Dev.	1,105	1,031	1,184	1,173	1,047	1,121	,876	,778	1,052
Total	Mean	2,63	4,06	3,02	3,41	4,26	3,75	3,90	3,87	3,20
	N	351	351	351	350	351	350	350	351	351
	Std. Dev.	1,144	1,054	1,205	1,121	,883	1,139	,926	,996	1,101

Table 4.11: *Cross table of field of study and engineering identity*

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
I feel like an engineer right now	Between Groups	19,889	4	4,972	3,926	,004
	Within Groups	438,219	346	1,267		
	Total	458,108	350			
I believe I will feel like an engineer in the future	Between Groups	41,521	4	10,380	10,34	<,001
	Within Groups	347,339	346	1,004		
	Total	388,860	350			
I see myself as an engineer	Between Groups	23,166	4	5,791	4,134	,003
	Within Groups	484,732	346	1,401		
	Total	507,897	350			
My parents see me as an engineer	Between Groups	9,175	4	2,294	1,841	,120
	Within Groups	429,754	345	1,246		
	Total	438,929	349			
I enjoy learning more about the engineering subjects	Between Groups	16,205	4	4,051	5,460	<,001
	Within Groups	256,718	346	,742		
	Total	272,923	350			
I feel that I belong in the field of engineering	Between Groups	49,496	4	12,374	10,60	<,001
	Within Groups	402,873	345	1,168		
	Total	452,369	349			
I feel that I understand the courses I am taking	Between Groups	11,889	4	2,972	3,565	,007
	Within Groups	287,611	345	,834		
	Total	299,500	349			
I can perform well in my exams	Between Groups	21,144	4	5,286	5,609	<,001
	Within Groups	326,087	346	,942		
	Total	347,231	350			
Others come to me regarding engineering questions	Between Groups	9,509	4	2,377	1,981	,097
	Within Groups	415,129	346	1,200		
	Total	424,638	350			

Table 4.12: *Result of ANOVA test of field of study and engineering identity*

The ANOVA test shows that current feelings of being an engineer, their belief in feeling like an engineer in the future, their self-identification as an engineer, their belief in feeling like an engineer, the sense of belonging in the field of engineering, their understanding of courses and their enjoyment of learning engineering subjects all show significant differences between fields of study ($p < 0.05$).

However, there was no significant difference between the fields for their parents view of them as engineers, and others asking them engineering questions ($p > 0.05$). The F-values are presented in Table 4.12.

4.3.3 Engineering Fields

Report

Field of study		Sustainable Development	The industry	Research	International work	Production	Product development	Technical work	Economics/Management
Technical and Natural Sciences	Mean	3,77	3,59	3,84	3,41	3,02	3,48	3,62	2,41
	N	120	121	120	119	120	120	119	120
	Std. Dev.	1,228	,997	1,108	1,217	1,177	1,174	1,041	1,273
Information and Communication Technology	Mean	3,19	3,13	3,67	3,43	2,82	3,71	4,17	2,96
	N	52	52	52	51	51	52	52	52
	Std. Dev.	1,189	1,048	1,167	1,153	1,072	1,035	,810	1,313
Engineering and Industrial Design	Mean	3,44	3,89	3,62	3,57	3,77	4,04	4,07	2,81
	N	82	82	82	82	81	81	81	81
	Std. Dev.	1,325	1,030	1,214	1,123	,991	1,188	,997	1,352
Business and Management	Mean	3,73	3,76	2,92	3,81	3,70	4,05	3,16	4,19
	N	37	37	37	37	37	37	37	37
	Std. Dev.	1,217	1,090	1,115	,995	1,127	1,053	1,236	1,076
Civil and Architectural Engineering	Mean	3,91	3,12	3,19	3,83	3,29	3,76	3,57	2,91
	N	58	58	58	58	58	58	58	58
	Std. Dev.	1,081	1,186	1,146	1,201	1,108	1,014	1,061	1,328
Total	Mean	3,62	3,53	3,56	3,56	3,29	3,75	3,75	2,86
	N	349	350	349	347	347	348	347	348
	Std. Dev.	1,239	1,091	1,184	1,167	1,154	1,137	1,068	1,379

Table 4.13: *Cross tables of fields of study and preferred engineering fields*

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Sustainable Development	Between Groups	20,223	4	5,056	3,386	,010
	Within Groups	513,605	344	1,493		
	Total	533,828	348			
The industry	Between Groups	30,780	4	7,695	6,907	<,001
	Within Groups	384,375	345	1,114		
	Total	415,154	349			
Research	Between Groups	33,661	4	8,415	6,371	<,001
	Within Groups	454,385	344	1,321		
	Total	488,046	348			
International work	Between Groups	9,945	4	2,486	1,843	,120
	Within Groups	461,346	342	1,349		
	Total	471,291	346			
Production	Between Groups	44,128	4	11,032	9,056	<,001
	Within Groups	416,627	342	1,218		
	Total	460,755	346			
Product development	Between Groups	18,706	4	4,676	3,730	,005
	Within Groups	430,041	343	1,254		
	Total	448,747	347			
Technical work	Between Groups	34,454	4	8,613	8,177	<,001
	Within Groups	360,232	342	1,053		
	Total	394,686	346			
Economics/Management	Between Groups	90,719	4	22,680	13,662	<,001
	Within Groups	569,382	343	1,660		
	Total	660,101	347			

Table 4.14: *Result of ANOVA test for fields of study and preferred engineering fields*

The ANOVA test shows that preferred engineering fields Sustainable Development, The Industry, Research, Production, Product Development, Technical Work, and Economics/Management all show significant differences between fields of study ($p < 0.05$). The F-values are presented in Table 4.14.

4.3.4 Factors Influencing Career Satisfaction

Report

Field of study		Salary and benefits	Become famous	Help other fellow human beings	Work with people	Lead people	Invent/design things	Development opportunities within the job	To develop new knowledge and skills	Having a good balance between work life and leisure
Technical and Natural Sciences	Mean	4,24	1,71	3,90	3,37	2,96	3,50	4,29	4,41	4,58
	N	121	120	121	121	121	121	121	121	121
	Std. Dev.	,786	,893	1,121	1,170	1,091	1,096	,821	,771	,772
Information and Communication Technology	Mean	4,25	1,62	3,83	2,88	2,73	3,79	4,06	4,40	4,58
	N	52	52	52	52	52	52	52	52	52
	Std. Dev.	,883	,889	,879	1,338	1,270	,936	,958	,799	,723
Engineering and Industrial Design	Mean	4,38	1,88	3,90	3,62	2,99	4,00	4,37	4,51	4,60
	N	81	81	81	81	81	81	81	81	80
	Std. Dev.	,603	1,005	1,068	1,056	,994	1,012	,697	,727	,773
Business and Management	Mean	4,62	1,89	3,70	3,54	3,81	2,92	4,60	4,43	4,43
	N	37	37	37	37	37	37	35	37	37
	Std. Dev.	,492	,875	,878	1,095	,811	1,064	,651	,765	1,015
Civil and Architectural Engineering	Mean	4,24	1,76	4,07	3,79	3,28	3,46	4,47	4,55	4,67
	N	58	58	57	58	58	57	58	58	58
	Std. Dev.	,709	,844	,863	1,072	1,073	1,269	,655	,705	,659
Total	Mean	4,32	1,76	3,90	3,44	3,07	3,59	4,33	4,46	4,58
	N	349	348	348	349	349	348	347	349	348
	Std. Dev.	,730	,910	1,010	1,175	1,104	1,121	,785	,752	,775

Table 4.15: *Cross tables of fields of study and factors influencing career satisfaction*

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Salary and benefits	Between Groups	5,071	4	1,268	2,419	,048
	Within Groups	180,259	344	,524		
	Total	185,330	348			
Become famous	Between Groups	3,151	4	,788	,951	,434
	Within Groups	284,053	343	,828		
	Total	287,204	347			
Help other fellow human beings	Between Groups	3,365	4	,841	,822	,512
	Within Groups	350,911	343	1,023		
	Total	354,276	347			
Work with people	Between Groups	26,746	4	6,687	5,073	<,001
	Within Groups	453,414	344	1,318		
	Total	480,160	348			
Lead people	Between Groups	30,789	4	7,697	6,733	<,001
	Within Groups	393,274	344	1,143		
	Total	424,063	348			
Invent/design things	Between Groups	34,420	4	8,605	7,345	<,001
	Within Groups	401,818	343	1,171		
	Total	436,239	347			
Development opportunities within the job	Between Groups	7,799	4	1,950	3,246	,012
	Within Groups	205,423	342	,601		
	Total	213,222	346			
To develop new knowledge and skills	Between Groups	1,117	4	,279	,491	,742
	Within Groups	195,531	344	,568		
	Total	196,648	348			
Having a good balance between work life and leisure	Between Groups	1,330	4	,332	,550	,699
	Within Groups	207,253	343	,604		
	Total	208,583	347			

Table 4.16: *Result of ANOVA test for fields of study and factors influencing career satisfaction*

The ANOVA test shows that the factors influencing career satisfaction such as salary and benefits, work with people, lead people, invent/design things, development opportunities within the job, and having a good balance between work life and leisure all show significant differences between fields of study ($p < 0.05$).

However, there was no significant difference between the fields for becoming famous, helping other fellow human beings, to develop new knowledge and skills ($p > 0.05$). The F-values are presented in Table 4.16.

4.4 High School Program

In this section, a cross table of the means and the results of the ANOVA tests are presented of the variable high school program, and their engineering identity and preferred engineering fields.

4.4.1 Engineering Identity

Report

	High school program											
	The natural science program			The technology program			Others			Total		
	Mean	N	Std. Dev.	Mean	N	Std. Dev.	Mean	N	Std. Dev.	Mean	N	Std. Dev.
I feel like an engineer right now	2,68	157	1,11	2,76	134	1,2	2,30	67	1,1	2,64	358	1,15
I believe I will feel like an engineer in the future	4,06	157	,982	4,22	134	,945	3,70	67	1,3	4,05	358	1,06
I see myself as an engineer	3,05	157	1,17	3,20	134	1,2	2,61	67	1,2	3,03	358	1,21
My parents see me as an engineer	3,29	156	1,11	3,60	134	1,1	3,36	67	1,2	3,42	357	1,12
I enjoy learning more about the engineering subjects	4,28	157	,823	4,37	134	,818	3,88	67	1,1	4,24	358	,903
I feel that I belong in the field of engineering	3,65	157	1,12	4,04	134	1,0	3,38	66	1,3	3,75	357	1,13
I feel that I understand the courses I am taking	3,92	156	,913	3,93	134	,943	3,70	67	1,0	3,89	357	,943
I can perform well in my exams	3,90	157	1,01	3,84	134	1,0	3,73	67	1,0	3,85	358	1,02
Others come to me regarding engineering questions	3,10	157	1,09	3,37	134	1,1	3,10	67	1,1	3,20	358	1,10

Table 4.17: *Cross table of high school program and engineering identity*

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
I feel like an engineer right now	Between Groups	10,052	2	5,026	3,892	,021
	Within Groups	458,464	355	1,291		
	Total	468,517	357			
I believe I will feel like an engineer in the future	Between Groups	11,857	2	5,929	5,435	,005
	Within Groups	387,238	355	1,091		
	Total	399,095	357			
I see myself as an engineer	Between Groups	15,711	2	7,856	5,544	,004
	Within Groups	503,063	355	1,417		
	Total	518,774	357			
My parents see me as an engineer	Between Groups	7,515	2	3,758	3,041	,049
	Within Groups	437,460	354	1,236		
	Total	444,975	356			
I enjoy learning more about the engineering subjects	Between Groups	11,023	2	5,511	6,993	,001
	Within Groups	279,796	355	,788		
	Total	290,818	357			
I feel that I belong in the field of engineering	Between Groups	21,728	2	10,864	8,819	<,001
	Within Groups	436,076	354	1,232		
	Total	457,804	356			
I feel that I understand the courses I am taking	Between Groups	2,789	2	1,395	1,575	,209
	Within Groups	313,502	354	,886		
	Total	316,291	356			
I can perform well in my exams	Between Groups	1,308	2	,654	,632	,532
	Within Groups	367,243	355	1,034		
	Total	368,550	357			
Others come to me regarding engineering questions	Between Groups	6,133	2	3,067	2,568	,078
	Within Groups	423,981	355	1,194		
	Total	430,115	357			

Table 4.18: *Result of ANOVA test for high school program and engineering identity*

Students from the Technology program generally have higher mean scores across all aspects, this is particularly evident in their belief in feeling like an engineer in the future (mean = 4.22), and their feeling of belonging in the engineering field (mean = 4.04). Students from Other programs have the lowest mean scores across most aspects, particularly in feeling like an engineer right now (mean = 2.30) and seeing themselves as an engineer (mean = 2.61), see Table 4.17.

The ANOVA test shows that the feelings of being an engineer right now, the belief in feeling like an engineer in the future, seeing oneself as an engineer, enjoying learning more about the engineering subjects, feeling that one belongs in the field of engineering, and understanding the courses one is taking all show significant differences between high school programs ($p < 0.05$).

However, there was no significant difference between the high school programs for parents seeing their children as engineers, performing well in exams, and others coming to them regarding engineering questions ($p > 0.05$). The F-values are presented in Table 4.18.

4.4.2 Engineering Fields

Report

	High school program											
	The natural science program			The technology program			Others			Total		
	Mean	N	Std. Dev.	Mean	N	Std. Dev.	Mean	N	Std. Dev.	Mean	N	Std. Dev.
Sustainable Development	3,83	156	1,185	3,43	134	1,20	3,47	66	1,34	3,61	356	1,234
The industry	3,60	157	1,085	3,51	134	1,08	3,41	66	1,16	3,53	357	1,098
Research	3,67	156	1,171	3,42	133	1,16	3,51	67	1,26	3,54	356	1,187
International work	3,57	154	1,176	3,49	134	1,17	3,76	66	1,10	3,57	354	1,162
Production	3,26	156	1,207	3,28	132	1,07	3,35	66	1,17	3,28	354	1,149
Product development	3,67	156	1,208	3,83	133	1,07	3,74	66	1,07	3,74	355	1,132
Technical work	3,62	154	1,042	3,93	133	,979	3,73	67	1,25	3,76	354	1,068
Economics/ Management	2,96	156	1,397	2,73	133	1,37	2,92	66	1,35	2,86	355	1,377

Table 4.19: *Cross table of high school program and engineering fields*

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Sustainable Development	Between Groups	13,646	2	6,823	4,571	,011
	Within Groups	526,860	353	1,493		
	Total	540,506	355			
The industry	Between Groups	1,774	2	,887	,735	,480
	Within Groups	427,167	354	1,207		
	Total	428,941	356			
Research	Between Groups	4,447	2	2,223	1,583	,207
	Within Groups	495,834	353	1,405		
	Total	500,281	355			
International work	Between Groups	3,285	2	1,642	1,218	,297
	Within Groups	473,306	351	1,348		
	Total	476,590	353			
Production	Between Groups	,394	2	,197	,149	,862
	Within Groups	465,357	351	1,326		
	Total	465,751	353			
Product development	Between Groups	1,703	2	,851	,663	,516
	Within Groups	451,971	352	1,284		
	Total	453,673	354			
Technical work	Between Groups	6,879	2	3,440	3,051	,049
	Within Groups	395,711	351	1,127		
	Total	402,590	353			
Economics/Management	Between Groups	3,947	2	1,974	1,041	,354
	Within Groups	667,563	352	1,896		
	Total	671,510	354			

Table 4.20: *Result of ANOVA test for high school program and engineering fields*

Students from the technology program show a higher mean score in their interest in product development (mean = 3.83) and technical work (mean = 3.93), meanwhile the natural science programs show a higher mean score in their interest in research (mean = 3.67) and sustainable development (mean = 3.83), see Table 4.20. The interest in sustainable development ($p = 0.011$) and technical work ($p = 0.049$) shows a statistically significant difference across the high school programs.

However, the interest in the industry, research, international work, production, product development, and economics/management do not significantly differ across the high school programs ($p > 0.05$).

The F-values are presented in Table 4.20. Additionally, there was no significant differences between the high school programs and their future career satisfaction, see Table A.30 in Appendix.

4.5 Parental STEM Background and Engineering Identity

In this section, a cross table of the means and the results of the t-test are presented of the variable parental STEM background and engineering identity.

Group Statistics

	Parents STEM	N	Mean	Std. Deviation	Std. Error Mean
I feel like an engineer right now	One or both	186	2,82	1,132	,083
	None	171	2,44	1,133	,087
I believe I will feel like an engineer in the future	One or both	186	4,26	,948	,069
	None	171	3,82	1,124	,086
I see myself as an engineer	One or both	186	3,22	1,217	,089
	None	171	2,81	1,163	,089
My parents see me as an engineer	One or both	186	3,45	1,125	,082
	None	170	3,39	1,116	,086
I enjoy learning more about the engineering subjects	One or both	186	4,34	,876	,064
	None	171	4,12	,919	,070
I feel that I belong in the field of engineering	One or both	186	3,96	1,067	,078
	None	170	3,50	1,158	,089
I feel that I understand the courses I am taking	One or both	185	3,92	,894	,066
	None	171	3,86	,972	,074
I can perform well in my exams	One or both	186	3,87	1,026	,075
	None	171	3,84	,986	,075
Others come to me regarding engineering questions	One or both	186	3,28	1,114	,082
	None	171	3,11	1,071	,082

Table 4.21: *Cross table of parental STEM background and engineering identity*

Independent Samples Test

	t-test for Equality of Means						
			Significance	Mean	Std. Error	95% Confidence Interval of the Difference	
	t	df	P-value	Difference	Difference	Lower	Upper
I feel like an engineer right now	3,20	355	<,001	,384	,120	,148	,620
I believe I will feel like an engineer in the future	4,00	355	<,001	,439	,110	,223	,655
I see myself as an engineer	3,23	355	<,001	,408	,126	,159	,656
My parents see me as an engineer	,533	354	,297	,063	,119	-,170	,297
I enjoy learning more about the engineering subjects	2,39	355	,009	,227	,095	,040	,414
I feel that I belong in the field of engineering	3,92	354	<,001	,462	,118	,230	,694
I feel that I understand the courses I am taking	,654	354	,257	,065	,099	-,130	,259
I can perform well in my exams	,325	355	,373	,035	,107	-,175	,245
Others come to me regarding engineering questions	1,45	355	,073	,168	,116	-,059	,396

Table 4.22: *Result of independent two-sample t-test for parental STEM background and engineering identity*

For students with at least one or more parents with STEM background the t-test shows statistically significant differences for the following aspects: The feeling of being an engineer right now, the belief in becoming an engineer in the future, and seeing oneself as an engineer, the feeling of belonging in the field of engineering, and the enjoyment of learning more about engineering subjects ($p < 0.05$).

The t-test results shows that there is no significant influence on personal interest if the student has at least one parent with STEM background ($p = 0.076$), see Table A.33 in Appendix.

Additionally, there is no significant impact on the preferred engineering field and future career satisfaction factors, see Tables A.27 and A.30 in Appendix.

5

Discussion and Analysis

In this chapter, a discussion and analysis of the study's findings are presented. The implications of these results are interpreted in the context of the research questions. Various factors influencing student program choice in engineering, such as gender, year in program, field of study, high school program, and parental STEM background, are examined. The chapter concludes with limitations of studied questions and suggestions for future research.

5.1 Discussion, Interpretation and Implications of Results

5.1.1 Relationship Between Gender and Engineering

The analysis revealed statistically significant differences between genders (see Section 4.1). In particular, when analyzing how the genders perceive their own engineering identities, it was found that male students have a stronger sense of engineering identity. This suggests that the engineering field remains predominantly male, as observed in previous research by Godwin et al. (2016).

When examining the differences in preferred engineering fields, the data reveal significant disparities between certain fields. Notably, the field of sustainable development is predominantly female, with a mean score of 4.01, compared to the male mean score of 3.36 (see Table 4.3). This finding aligns with the study by Chen et al. (2023), which demonstrates a correlation between women in engineering and their interest in societal and environmental values.

The industry and technical work also showed statistical significance in the favor of male engineering students. The industry is a traditionally male dominant field so there is no surprise of these findings. The reason is usually societal pressures and stereotypes, family and cultural norms plays a significant role when shaping career choices. Male dominant industries also often have cultures that prioritize traits associated with masculinity, making it challenging for women to thrive. While gender bias and the overrepresentation of men are common in the engineering field, the situation is reversed in other fields. For instance, in industries like law, higher education, and health care, women tend to outnumber men (Diehl et al., 2022).

The results suggest that there are gender differences in factors influencing career satisfaction. There were two factors that were especially significant. Firstly, males tend to place greater importance on having a future job that involves inventing or designing things, this preference aligns with historical patterns, as men have for centuries built and designed cities. Secondly, women tend to prioritize helping fellow human beings as a critical aspect of their future job satisfaction. This preferences aligns with existing stereotypes and societal expectations, as females are often associated with nurturing qualities and emotional empathy.

5.1.2 Influence of Current Year in Program on Engineering Identity

The data shows that the engineering identity of the students progressively increased as they advanced through their first three years of university education, see Section 4.2. This is a positive indication that students are obtaining knowledge and skills during their education, which can be applied within their future field of engineering, thus shaping their identity.

However, the data shows a notably low mean score for first-year students, with a mean of 2.34 on a scale of 1 to 5, see Table 4.7. Considering that STEM currently is a highly topical subject where Sweden has chosen to make political investments (Swedish Government, 2023), there is significant opportunity to increase students' engagement with their engineering studies and thus reduce the risk of eventual dropouts from the program. One suggestion for this could be to include more courses that have a direct relationship to practical realities of engineering professions, rather than solely focusing on shaping the first-year curriculum with theoretical foundations. There is recent research done at Chinese University that explored the relationship between practice-oriented learning experiences and engineering identity and found that there are positive impacts on such educational strategies (Ju & Zhu, 2023).

5.1.3 Students' Field of Study and Their Personal Interest and Relationship to Engineering

The influence of students personal interests and passions on their study choice are more important for students in some fields than others. The three areas most affected by students' personal interests were "Technical and Natural Sciences", "Information and Communication Technology", and "Engineering and Industrial Design". On the other hand, "Business and Management" and "Civil and Architectural Engineering" were less influenced by students' personal interests, see Section 4.3.

For higher education institutions, it is encouraging to see students pursuing their passions and selecting relevant educational programs. Therefore, it is interesting to understand why students choose study fields such as "Business and Management" and "Civil and Architectural Engineering", which generally have higher admission points at the university level, despite these fields being less influenced by their personal interests and passions. Further research could investigate deeper into this phenomenon.

Engineering identity and the preferred future work field differ significantly depending on the field of study. This is to be expected, as the extent of engineering content varies across different programs. For instance, "Business and Management" incorporates a considerable amount of economics in its curriculum, which tends to result in a lower average score for engineering identity and a higher inclination towards working in economics in the future. Such findings suggest that many students have appropriately aligned their educational choices with their interests and career aspirations.

5.1.4 Impact of High School Program Background on Students

The ANOVA test shows that there are statistically significant differences depending on which high school program the students attended in terms of their engineering identity and preferred engineering field, see Section 4.4.

The data show a pattern that those who attended the technology program have a high mean when it comes to questions related to engineering identity. This is not surprising as those who study the technology program in high school have already gained a broader insight into potential engineering areas they might consider working with, as several of the courses in the technology program include project-based learning experiences.

Furthermore, the progression from the technology high school program to an engineering education is a logical transition, considering the alignment with their preexisting technical interests and passions. The data shows a higher mean score of 4,34 for the technology program students' interest and passions, see Table A.22 in Appendix. However, the results do not show that their high school program choice had any statistical impact on their personal interests and passions, see Table A.23 in Appendix.

The results show that the preferred fields like sustainable development and technical work had statistical significance depending on the students' high school program. The students from the natural science program, with a mean score of 3.83, showed a higher interest towards sustainable development compared to the other programs, who scored means of 3.43 and 3.47 respectively, see Table 4.19. This can be attributed to the inherent alignment of the natural science program with science-based interests. Since the program focuses on practical experiences gained from lab work and research projects, it is likely that that their interest and understanding align with the sustainability field. However, for technical work, the technology program scored a high mean of 3.93, compared to 3.73 and 3.62 from other programs, see Table 4.20. As earlier mentioned, this suggests that students from the technology program often have a stronger preference or aptitude for technical work.

5.1.5 Parental STEM Background and Its Influence on Engineering Identity

The analysis revealed a significant correlation between parental STEM background and students' self-perception as engineers, see Section 4.5. This finding is particularly noteworthy due to the pronounced differences observed between students with and without a parental STEM background.

Students with one or more parents in STEM fields demonstrated a stronger identification with engineering. This suggests that parental influence not only affects children's educational choices towards the STEM-field, but also appears to shape students' self-concept and engineering identity. This phenomenon could be attributed to several factors. Parents in STEM fields might provide early exposure to scientific and technical concepts, foster a problem-solving mindset in their daily lives, or give insights into the realities of working in a STEM field when fostering their children. These experiences could help children develop a strong affinity for engineering from an early age. Fostering a strong engineering identity among students can make a positive impact on the future engineering workforce. In the case of Sweden, this will enhance the country's technical expertise but also its global competitiveness. Therefore it is in the interest of the nation to develop as proficient engineers as possible. Aligning with the Swedish Governments Swedish Government (2024) initiative to strengthen the country's education and research policies, as a well-known engineering country.

However, the lower self-identification as engineers among students without a parental STEM background raises intriguing questions. Despite choosing to study engineering, these students seem less likely to identify as engineers. This implies that universities need to enhance inclusion strategies and develop relation to engineering for all students, regardless of their background.

5.2 Answers to Research Questions

5.2.1 How do the engineering students' background, field of study, gender, and year of study influence their relation to engineering?

This study suggests that the engineering students' background, field of study, gender, and year of study does have an influence on their relation to engineering.

For student's background we notice a statistically significant difference for students with at least one parent within the STEM-field. This suggests that parental influence not only affects children's educational choices towards the STEM-field, but also appears to shape students' self-concept and engineering identity. Students previous high school program also has a significant impact on their engineering identity and preferred engineering field.

Male students tend to have a stronger engineering identity, this indicates that the engineering field remains male-dominant. There are also significant differences between the genders in terms of preferred future engineering fields.

Furthermore, it is noticed that the engineering identity of students tend to increase as they process through their engineering education. However, first-year students show a notably low mean score for engineering identity.

5.2.2 How do personal interests and passions impact the choice of engineering program among students?

The students' personal interests and passions differs significantly depending on the studied program field. For instance, students that opt for a program within "Technical and Natural Sciences", "Information and Communication Technology", and "Engineering and Industrial Design" are more likely to follow their personal interest and passion. However, for the students that opt for programs within "Business and Management" and "Civil and Architectural Engineering" it is observed that they are less influenced by their personal interest and passions in comparison to the earlier mentioned program fields.

5.3 Limitations

Not all survey questions were considered in this study. This is due to the inability to conduct relevant analyses on all questions, as well as some questions being outside the scope of the research questions of this study. For instance, the national background of students' parents was excluded from any analysis as 90% of the responses indicated that their parents were from Sweden.

No analysis was conducted regarding age, nor the question of why students chose to study at Chalmers, how important Chalmers' reputation was when they made their program choice, or whether they had completed a technical foundation year. This is because it would not have been possible to conduct a deeper scientific investigation on this data.

In this study, no corrections for multiple hypothesis testing such as Bonferroni correction were applied. When conducting multiple statistical tests, there is an increased risk of Type I errors, meaning that some of the reported statistical results may be false positives. Therefore, the reported p-values may be inaccurately low, leading to an overestimation of the significance of some findings.

These limitations need to be taken into account when interpreting the findings of this study and when using the results for quality improvement initiatives at Chalmers or further research.

5.4 Future Research

The understanding of engineering identity is becoming more researched in recent years. There are a lot of interesting ideas for future research in this area.

For instance, future research could explore the correlation between parental STEM background and students' self-perception as engineers. To understand this phenomenon in more detail, future research could for instance, explore what specific aspects of parental influence shape students' self-concept and engineering identity.

Furthermore, it would be beneficial for future research to examine whether the observed correlation between a parent's STEM background and the development of an engineering identity persists after the completion of formal education, as a suggestion, within the first 1-2 years of their career. This study would be of significant academic and industry interest, as the professional environment is where the engineering identity plays the most significant role.

This study also found that first-year students show a notably low self-perception as engineers. Future research could explore the causes for this and explore strategies to increase engagement with the aim to reduce dropout rates among first-year students.

6

Conclusion

In conclusion, a survey at Chalmers has been conducted and the data analyzed for this research has provided significant insights into the factors that influence engineering students' relation with their field of study. The analysis revealed that gender, year of study, field of study, and background, particularly parental STEM background, all play significant roles in shaping students' engineering identity and their choice of engineering program.

The study found that male students tend to have a stronger engineering identity, indicating that the engineering field remains predominantly male. However, the interest in sustainable development is predominantly female, suggesting that gender influences not only students' self-perception as engineers but also their preferred engineering fields.

The research also showed that the engineering identity of students tends to increase as they progress through their university education. However, first-year students show a notably low mean score, suggesting a need for strategies to increase engagement and reduce dropout rates among first-year students.

Furthermore, the study found that the influence of students personal interests and passions on their study choice are more important for students in some fields than others. It was observed that the program fields "Business and Management" and "Civil and Architectural Engineering" are less influenced by students' personal interests, raising interesting questions about why students choose these programs despite them being less aligned with their personal interests.

Additionally, the study revealed a significant correlation between parental STEM background and students' self-perception as engineers. Students with at least one parent in STEM fields showed a stronger identification with engineering, suggesting that parental influence not only affects children's educational choices towards the STEM-field, but also appears to shape students' self-concept and engineering identity.

Ultimately, investing in quality engineering education is not only beneficial for the individual, but also for the country as a whole. In the case of Sweden, fostering a strong engineering identity among students can make a positive impact on the future engineering workforce. This will enhance the country's technical expertise but also its global competitiveness. Therefore, as a well-known engineering country, it is in the interest of the nation to develop as proficient engineers as possible.

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A

Result tables

Independent Samples Effect Sizes

		Standardizer[a]	Point Estimate	95% Confidence Interval	
				Lower	Upper
I feel like an engineer right now	Cohen's d	1,126	,434	,217	,650
I believe I will feel like an engineer in the future	Cohen's d	1,057	,137	-,078	,351
I see myself as an engineer	Cohen's d	1,193	,370	,153	,585
My parents see me as an engineer	Cohen's d	1,111	,189	-,026	,405
I enjoy learning more about the engineering subjects	Cohen's d	,896	,317	,101	,532
I feel that I belong in the field of engineering	Cohen's d	1,118	,420	,203	,637
I feel that I understand the courses I am taking	Cohen's d	,928	,280	,064	,496
I can perform well in my exams	Cohen's d	1,002	,035	-,180	,249
Others come to me regarding engineering questions	Cohen's d	1,083	,312	,096	,527

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.

Table A.1: *Effect size for gender and engineering identity*

Independent Samples Effect Sizes

		Standardizer[a]	Point Estimate	95% Confidence Interval Lower	95% Confidence Interval Upper
Sustainable Development	Cohen's d	1,195	-,539	-,757	-,320
The industry	Cohen's d	1,080	,398	,182	,614
Research	Cohen's d	1,187	,113	-,102	,327
International work	Cohen's d	1,163	-,075	-,290	,140
Production	Cohen's d	1,146	,133	-,082	,348
Product development	Cohen's d	1,136	,084	-,130	,299
Technical work	Cohen's d	1,030	,560	,341	,779
Economics/Management	Cohen's d	1,371	,212	-,004	,427

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.

Table A.2: *Effect size for gender and preferred engineering field*

Independent Samples Effect Sizes

		Standardizer[a]	Point Estimate	95% Confidence Interval Lower	95% Confidence Interval Upper
Salary and benefits	Cohen's d	,727	-,149	-,364	,066
Become famous	Cohen's d	,895	,384	,167	,600
Help other fellow human beings	Cohen's d	1,020	-,380	-,597	-,163
Work with people	Cohen's d	1,175	-,190	-,405	,025
Lead people	Cohen's d	1,097	-,031	-,246	,183
Invent/design things	Cohen's d	1,097	,412	,195	,629
Development opportunities within the job	Cohen's d	,781	-,192	-,407	,024
To develop new knowledge and skills	Cohen's d	,751	-,089	-,303	,126
Having a good balance between work life and leisure	Cohen's d	,755	-,473	-,691	-,255

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.

Table A.3: *Effect size for gender and factors influencing career satisfaction*

Report

	Läsår											
	1			2			3			Total		
	Mean	N	Std. Dev.	Mean	N	Std. Dev.	Mean	N	Std. Dev.	Mean	N	Std. Dev.
Sustainable Development	3,45	127	1,25	3,72	104	1,22	3,64	114	1,24	3,59	345	1,24
The industry	3,47	127	1,15	3,53	105	1,07	3,60	114	1,05	3,53	346	1,09
Research	3,52	126	1,18	3,63	105	1,11	3,42	114	1,25	3,52	345	1,18
International work	3,71	126	1,09	3,72	105	1,10	3,29	114	1,25	3,57	345	1,16
Production	3,38	125	1,13	3,38	104	1,02	3,10	114	1,23	3,29	343	1,14
Product development	3,82	125	1,14	3,87	105	1,01	3,54	114	1,21	3,74	344	1,13
Technical work	3,70	126	1,07	3,90	105	1,06	3,65	114	1,09	3,74	345	1,07
Economics/ Management	2,89	125	1,40	2,91	105	1,29	2,81	114	1,42	2,87	344	1,37

Table A.4: *Cross table of year of study and preferred engineering fields*

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Sustainable Development	Between Groups	4,603	2	2,302	1,501	,224
	Within Groups	524,585	342	1,534		
	Total	529,188	344			
The industry	Between Groups	,925	2	,462	,386	,680
	Within Groups	411,225	343	1,199		
	Total	412,150	345			
Research	Between Groups	2,355	2	1,177	,843	,431
	Within Groups	477,732	342	1,397		
	Total	480,087	344			
International work	Between Groups	13,792	2	6,896	5,234	,006
	Within Groups	450,573	342	1,317		
	Total	464,365	344			
Production	Between Groups	6,118	2	3,059	2,386	,094
	Within Groups	435,882	340	1,282		
	Total	442,000	342			
Product development	Between Groups	6,946	2	3,473	2,726	,067
	Within Groups	434,542	341	1,274		
	Total	441,488	343			
Technical work	Between Groups	3,688	2	1,844	1,608	,202
	Within Groups	392,352	342	1,147		
	Total	396,041	344			
Economics/Management	Between Groups	,698	2	,349	,185	,831
	Within Groups	644,415	341	1,890		
	Total	645,113	343			

Table A.5: *Result of ANOVA test for year of study and preferred engineering fields*

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval Lower	Upper
I feel like an engineer right now	Eta-squared	,047	,011	,094
I believe I will feel like an engineer in the future	Eta-squared	,009	,000	,035
I see myself as an engineer	Eta-squared	,018	,000	,052
My parents see me as an engineer	Eta-squared	,016	,000	,047
I enjoy learning more about the engineering subjects	Eta-squared	,011	,000	,039
I feel that I belong in the field of engineering	Eta-squared	,002	,000	,016
I feel that I understand the courses I am taking	Eta-squared	,000	,000	,005
I can perform well in my exams	Eta-squared	,001	,000	,012
Others come to me regarding engineering questions	Eta-squared	,008	,000	,032

a. Eta-squared is estimated based on the fixed-effect model.

Table A.6: *Effect size for year of study and engineering identity*

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval Lower	Upper
Sustainable Development	Eta-squared	,009	,000	,034
The industry	Eta-squared	,002	,000	,017
Research	Eta-squared	,005	,000	,025
International work	Eta-squared	,030	,003	,070
Production	Eta-squared	,014	,000	,044
Product development	Eta-squared	,016	,000	,047
Technical work	Eta-squared	,009	,000	,035
Economics/Management	Eta-squared	,001	,000	,012

a. Eta-squared is estimated based on the fixed-effect model.

Table A.7: *Effect size for year of study and preferred engineering field*

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval Lower	Upper
Salary and benefits	Eta-squared	,002	,000	,018
Become famous	Eta-squared	,027	,002	,066
Help other fellow human beings	Eta-squared	,016	,000	,048
Work with people	Eta-squared	,003	,000	,021
Lead people	Eta-squared	,003	,000	,021
Invent/design things	Eta-squared	,013	,000	,043
Development opportunities within the job	Eta-squared	,009	,000	,036
To develop new knowledge and skills	Eta-squared	,030	,003	,070
Having a good balance between work life and leisure	Eta-squared	,008	,000	,033

a. Eta-squared is estimated based on the fixed-effect model.

Table A.8: *Effect size for year of study and factors influencing career satisfaction*

Report

	Läsår											
	1			2			3			Total		
	Mean	N	Std. Dev.	Mean	N	Std. Dev.	Mean	N	Std. Dev.	Mean	N	Std. Dev.
Salary and benefits	4,36	126	,675	4,32	105	,766	4,27	114	,732	4,32	345	,721
Become famous	1,95	125	,923	1,67	105	,906	1,62	114	,866	1,76	344	,909
Help other fellow human beings	3,94	125	1,03	3,98	105	,909	3,68	114	1,12	3,87	344	1,03
Work with people	3,39	126	1,21	3,53	105	1,11	3,39	114	1,20	3,43	345	1,17
Lead people	3,16	126	1,18	3,08	105	1,03	3,01	114	1,03	3,08	345	1,09
Invent/design things	3,56	125	1,13	3,74	105	1,08	3,42	114	1,15	3,57	344	1,13
Development opportunities within the job	4,34	125	,824	4,42	105	,704	4,23	113	,813	4,33	343	,787
To develop new knowledge and skills	4,52	126	,724	4,55	105	,693	4,25	114	,839	4,44	345	,764
Having a good balance between work life and leisure	4,52	126	,892	4,69	105	,609	4,57	113	,778	4,58	344	,778

Table A.9: *Cross table of year of study and factors influencing career satisfaction*

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Salary and benefits	Between Groups	,438	2	,219	,420	,657
	Within Groups	178,489	342	,522		
	Total	178,928	344			
Become famous	Between Groups	7,662	2	3,831	4,736	,009
	Within Groups	275,826	341	,809		
	Total	283,488	343			
Help other fellow human beings	Between Groups	5,912	2	2,956	2,791	,063
	Within Groups	361,201	341	1,059		
	Total	367,113	343			
Work with people	Between Groups	1,554	2	,777	,562	,571
	Within Groups	473,095	342	1,383		
	Total	474,649	344			
Lead people	Between Groups	1,355	2	,678	,572	,565
	Within Groups	405,207	342	1,185		
	Total	406,562	344			
Invent/design things	Between Groups	5,679	2	2,839	2,248	,107
	Within Groups	430,647	341	1,263		
	Total	436,326	343			
Development opportunities within the job	Between Groups	1,985	2	,992	1,609	,202
	Within Groups	209,788	340	,617		
	Total	211,773	342			
To develop new knowledge and skills	Between Groups	5,979	2	2,989	5,242	,006
	Within Groups	195,053	342	,570		
	Total	201,032	344			
Having a good balance between work life and leisure	Between Groups	1,706	2	,853	1,413	,245
	Within Groups	205,849	341	,604		
	Total	207,555	343			

Table A.10: *Result of ANOVA test for year of study and factors influencing career satisfaction*

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval Lower	Upper
Salary and benefits	Eta-squared	,002	,000	,018
Become famous	Eta-squared	,027	,002	,066
Help other fellow human beings	Eta-squared	,016	,000	,048
Work with people	Eta-squared	,003	,000	,021
Lead people	Eta-squared	,003	,000	,021
Invent/design things	Eta-squared	,013	,000	,043
Development opportunities within the job	Eta-squared	,009	,000	,036
To develop new knowledge and skills	Eta-squared	,030	,003	,070
Having a good balance between work life and leisure	Eta-squared	,008	,000	,033

a. Eta-squared is estimated based on the fixed-effect model.

Table A.11: *Effect size for year of study and factors influencing career satisfaction*

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval Lower	Upper
Personal interest	Eta-squared	,036	,002	,072

a. Eta-squared is estimated based on the fixed-effect model.

Table A.12: *Effect size for field of study and their personal interest and passion*

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval	
			Lower	Upper
I feel like an engineer right now	Eta-squared	,043	,005	,083
I believe I will feel like an engineer in the future	Eta-squared	,107	,046	,162
I see myself as an engineer	Eta-squared	,046	,006	,086
My parents see me as an engineer	Eta-squared	,021	,000	,049
I enjoy learning more about the engineering subjects	Eta-squared	,059	,014	,104
I feel that I belong in the field of engineering	Eta-squared	,109	,048	,165
I feel that I understand the courses I am taking	Eta-squared	,040	,003	,078
I can perform well in my exams	Eta-squared	,061	,015	,106
Others come to me regarding engineering questions	Eta-squared	,022	,000	,051

a. Eta-squared is estimated based on the fixed-effect model.

Table A.13: *Effect size for field of study and engineering identity*

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval	
			Lower	Upper
Sustainable Development	Eta-squared	,038	,002	,075
The industry	Eta-squared	,074	,023	,123
Research	Eta-squared	,069	,020	,117
International work	Eta-squared	,021	,000	,049
Production	Eta-squared	,096	,038	,149
Product development	Eta-squared	,042	,004	,080
Technical work	Eta-squared	,087	,032	,139
Economics/Management	Eta-squared	,137	,070	,197

a. Eta-squared is estimated based on the fixed-effect model.

Table A.14: *Effect size for field of study and preferred engineering field*

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval Lower	Upper
Salary and benefits	Eta-squared	,027	,000	,059
Become famous	Eta-squared	,011	,000	,031
Help other fellow human beings	Eta-squared	,009	,000	,027
Work with people	Eta-squared	,056	,012	,099
Lead people	Eta-squared	,073	,022	,121
Invent/design things	Eta-squared	,079	,026	,129
Development opportunities within the job	Eta-squared	,037	,002	,073
To develop new knowledge and skills	Eta-squared	,006	,000	,018
Having a good balance between work life and leisure	Eta-squared	,006	,000	,020

a. Eta-squared is estimated based on the fixed-effect model.

Table A.15: *Effect size for field of study and factors influencing career satisfaction*

Field of Study

	Frequency	Percent	Valid Percent	Cumulative Percent
Technical and Natural Sciences	122	34,0	34,0	34,0
Information and Communication Technology	52	14,5	14,5	48,5
Engineering and Industrial Design	82	22,8	22,8	71,3
Business and Management	38	10,6	10,6	81,9
Civil and Architectural Engineering	58	16,2	16,2	98,1
Other Programs	7	1,9	1,9	100,0
Total	359	100,0	100,0	

Table A.16: *Cross table presenting the count of individuals across all fields of study*

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval Lower	95% Confidence Interval Upper
I feel like an engineer right now	Eta-squared	,021	,000	,056
I believe I will feel like an engineer in the future	Eta-squared	,030	,003	,069
I see myself as an engineer	Eta-squared	,030	,003	,070
My parents see me as an engineer	Eta-squared	,017	,000	,049
I enjoy learning more about the engineering subjects	Eta-squared	,038	,007	,081
I feel that I belong in the field of engineering	Eta-squared	,047	,012	,094
I feel that I understand the courses I am taking	Eta-squared	,009	,000	,034
I can perform well in my exams	Eta-squared	,004	,000	,021
Others come to me regarding engineering questions	Eta-squared	,014	,000	,044

a. Eta-squared is estimated based on the fixed-effect model.

Table A.17: *Effect size for high school program and engineering identity*

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval Lower	95% Confidence Interval Upper
Sustainable Development	Eta-squared	,025	,001	,062
The industry	Eta-squared	,004	,000	,023
Research	Eta-squared	,009	,000	,034
International work	Eta-squared	,007	,000	,030
Production	Eta-squared	,001	,000	,010
Product development	Eta-squared	,004	,000	,022
Technical work	Eta-squared	,017	,000	,049
Economics/Management	Eta-squared	,006	,000	,027

a. Eta-squared is estimated based on the fixed-effect model.

Table A.18: *Effect size for high school program and preferred engineering field*

Report

	High school program											
	The natural science program			The technology program			Others			Total		
	Mean	N	Std. Dev.	Mean	N	Std. Dev.	Mean	N	Std. Dev.	Mean	N	Std. Dev.
Salary and benefits	4,28	157	,715	4,26	133	,755	4,50	66	,685	4,31	356	,728
Become famous	1,78	156	,939	1,77	133	,834	1,65	66	,984	1,75	355	,909
Help other fellow human beings	4,03	156	1,019	3,72	133	,956	3,77	66	1,16	3,87	355	1,03
Work with people	3,55	157	1,195	3,29	133	1,08	3,42	66	1,28	3,43	356	1,17
Lead people	3,03	157	1,115	3,07	133	1,03	3,20	66	1,19	3,07	356	1,10
Invent/design things	3,46	157	1,071	3,75	132	1,12	3,50	66	1,19	3,57	355	1,12
Development opportunities within the job	4,35	156	,776	4,23	132	,818	4,45	66	,748	4,32	354	,789
To develop new knowledge and skills	4,41	157	,855	4,44	133	,678	4,56	66	,682	4,45	356	,762
Having a good balance between work life and leisure	4,55	157	,812	4,59	132	,687	4,65	66	,832	4,59	355	,770

Table A.19: *Cross table of high school program and factors influencing career satisfaction*

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Salary and benefits	Between Groups	2,913	2	1,457	2,772	,064
	Within Groups	185,477	353	,525		
	Total	188,390	355			
Become famous	Between Groups	,837	2	,418	,506	,604
	Within Groups	291,349	352	,828		
	Total	292,186	354			
Help other fellow human beings	Between Groups	7,640	2	3,820	3,643	,027
	Within Groups	369,137	352	1,049		
	Total	376,777	354			
Work with people	Between Groups	5,191	2	2,595	1,893	,152
	Within Groups	484,054	353	1,371		
	Total	489,244	355			
Lead people	Between Groups	1,373	2	,686	,568	,567
	Within Groups	426,728	353	1,209		
	Total	428,101	355			
Invent/design things	Between Groups	6,541	2	3,270	2,639	,073
	Within Groups	436,231	352	1,239		
	Total	442,772	354			
Development opportunities within the job	Between Groups	2,250	2	1,125	1,817	,164
	Within Groups	217,391	351	,619		
	Total	219,641	353			
To develop new knowledge and skills	Between Groups	1,111	2	,555	,957	,385
	Within Groups	204,875	353	,580		
	Total	205,986	355			
Having a good balance between work life and leisure	Between Groups	,446	2	,223	,374	,688
	Within Groups	209,684	352	,596		
	Total	210,130	354			

Table A.20: *Result of ANOVA test for high school program and factors influencing career satisfaction*

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval Lower	Upper
Salary and benefits	Eta-squared	,015	,000	,046
Become famous	Eta-squared	,003	,000	,019
Help other fellow human beings	Eta-squared	,020	,000	,055
Work with people	Eta-squared	,011	,000	,037
Lead people	Eta-squared	,003	,000	,020
Invent/design things	Eta-squared	,015	,000	,045
Development opportunities within the job	Eta-squared	,010	,000	,037
To develop new knowledge and skills	Eta-squared	,005	,000	,026
Having a good balance between work life and leisure	Eta-squared	,002	,000	,017

a. Eta-squared is estimated based on the fixed-effect model.

Table A.21: *Effect size for high school program and factors influencing career satisfaction*

Report

Personal interest

High school program	Mean	N	Std. Deviation
1	4,20	157	,845
2	4,34	134	,805
3	4,12	68	,955
Total	4,24	359	,854

Table A.22: *Cross table of high school program and personal interest and passion*

ANOVA

Personal interest

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2,653	2	1,326	1,825	,163
Within Groups	258,745	356	,727		
Total	261,398	358			

Table A.23: *Result of ANOVA test for high school program and personal interest and passion*

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval	
			Lower	Upper
Personal interest	Eta-squared	,010	,000	,036

a. Eta-squared is estimated based on the fixed-effect model.

Table A.24: *Effect size for high school program and personal interest and passion*

Independent Samples Effect Sizes

		Standardizer[a]	Point Estimate	95% Confidence Interval Lower	95% Confidence Interval Upper
I feel like an engineer right now	Cohen's d	1,132	,339	,130	,548
I believe I will feel like an engineer in the future	Cohen's d	1,036	,424	,213	,633
I see myself as an engineer	Cohen's d	1,191	,342	,133	,551
My parents see me as an engineer	Cohen's d	1,120	,057	-,151	,265
I enjoy learning more about the engineering subjects	Cohen's d	,897	,253	,045	,462
I feel that I belong in the field of engineering	Cohen's d	1,111	,416	,206	,626
I feel that I understand the courses I am taking	Cohen's d	,932	,069	-,139	,277
I can perform well in my exams	Cohen's d	1,007	,034	-,173	,242
Others come to me regarding engineering questions	Cohen's d	1,093	,154	-,054	,362

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.

Table A.25: *Effect size for parental STEM background and engineering identity*

Group Statistics

	Parents STEM	N	Mean	Std. Deviation	Std. Error Mean
Sustainable Development	One or both	186	3,62	1,199	,088
	None	169	3,60	1,274	,098
The industry	One or both	187	3,61	1,079	,079
	None	169	3,43	1,111	,085
Research	One or both	185	3,50	1,203	,088
	None	170	3,59	1,170	,090
International work	One or both	186	3,60	1,223	,090
	None	167	3,53	1,091	,084
Production	One or both	185	3,34	1,116	,082
	None	168	3,21	1,179	,091
Product development	One or both	186	3,80	1,101	,081
	None	168	3,68	1,165	,090
Technical work	One or both	185	3,82	1,141	,084
	None	168	3,69	,979	,075
Economics/Management	One or both	186	2,90	1,395	,102
	None	168	2,81	1,353	,104

Table A.26: *Cross table of STEM parental background and preferred engineering field*

Independent Samples Test

	t-test for Equality of Means					
					95% Confidence Interval of the Difference	
	df	Significance P-value	Mean Difference	Std. Error Difference	Lower	Upper
Sustainable Development	353	,438	,021	,131	-,238	,279
The industry	354	,063	,178	,116	-,051	,406
Research	353	,236	-,091	,126	-,339	,157
International work	351	,288	,069	,124	-,174	,313
Production	351	,162	,121	,122	-,119	,361
Product development	352	,166	,117	,120	-,120	,354
Technical work	351	,135	,126	,114	-,098	,349
Economics/Management	352	,261	,094	,146	-,194	,382

Table A.27: *Result of independent two-sample t-test for STEM parental background and preferred engineering field*

Independent Samples Effect Sizes

				95% Confidence Interval	
		Standardizer[a]	Point Estimate	Lower	Upper
Sustainable Development	Cohen's d	1,235	,017	-,192	,225
The industry	Cohen's d	1,094	,162	-,046	,371
Research	Cohen's d	1,187	-,077	-,285	,132
International work	Cohen's d	1,162	,060	-,149	,268
Production	Cohen's d	1,147	,105	-,104	,314
Product development	Cohen's d	1,132	,103	-,105	,312
Technical work	Cohen's d	1,067	,118	-,091	,327
Economics/ Management	Cohen's d	1,376	,068	-,141	,277

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.

Table A.28: *Effect size for parental STEM background and preferred engineering field*

Group Statistics

	Parents STEM	N	Mean	Std. Deviation	Std. Error Mean
Salary and benefits	One or both	186	4,25	,782	,057
	None	169	4,37	,662	,051
Become famous	One or both	185	1,74	,914	,067
	None	169	1,77	,906	,070
Help other fellow human beings	One or both	186	3,85	1,058	,078
	None	168	3,88	1,008	,078
Work with people	One or both	186	3,52	1,182	,087
	None	169	3,34	1,164	,090
Lead people	One or both	186	3,08	1,083	,079
	None	169	3,07	1,119	,086
Invent/design things	One or both	186	3,53	1,126	,083
	None	168	3,63	1,114	,086
Development opportunities within the job	One or both	185	4,36	,797	,059
	None	168	4,28	,781	,060
To develop new knowledge and skills	One or both	186	4,50	,766	,056
	None	169	4,38	,756	,058
Having a good balance between work life and leisure	One or both	185	4,64	,661	,049
	None	169	4,52	,873	,067

Table A.29: *Cross table of STEM parental background and factors influencing career satisfaction*

Independent Samples Test

	t-test for Equality of Means						
						95% Confidence Interval of the Difference	
	t	df	Significance P-value	Mean Difference	Std. Error Difference	Lower	Upper
Salary and benefits	-1,55	353	,061	-,120	,077	-,272	,032
Become famous	-,296	352	,384	-,029	,097	-,219	,162
Help other fellow human beings	-,237	352	,406	-,026	,110	-,243	,190
Work with people	1,434	353	,076	,179	,125	-,066	,424
Lead people	,087	353	,465	,010	,117	-,220	,240
Invent/design things	-,873	352	,192	-,104	,119	-,339	,130
Development opportunities within the job	,980	351	,164	,082	,084	-,083	,248
To develop new knowledge and skills	1,427	353	,077	,115	,081	-,044	,274
Having a good balance between work life and leisure	1,496	352	,068	,123	,082	-,039	,284

Table A.30: *Result of independent two-sample t-test for STEM parental background and factors influencing career satisfaction*

Independent Samples Effect Sizes

				95% Confidence Interval	
		Standardizer[a]	Point Estimate	Lower	Upper
Salary and benefits	Cohen's d	,727	-,165	-,374	,044
Become famous	Cohen's d	,910	-,032	-,240	,177
Help other fellow human beings	Cohen's d	1,034	-,025	-,234	,183
Work with people	Cohen's d	1,174	,152	-,056	,361
Lead people	Cohen's d	1,100	,009	-,199	,218
Invent/design things	Cohen's d	1,120	-,093	-,302	,116
Development opportunities within the job	Cohen's d	,789	,104	-,105	,313
To develop new knowledge and skills	Cohen's d	,761	,152	-,057	,360
Having a good balance between work life and leisure	Cohen's d	,770	,159	-,050	,368

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.

Table A.31: *Effect size for parental STEM background and factors influencing career satisfaction*

Group Statistics

	Parents STEM	N	Mean	Std. Deviation	Std. Error Mean
Personal interest	One or both	187	4,30	,865	,063
	None	171	4,17	,840	,064

Table A.32: *Effect size for parental STEM background and personal interest and passion*

Independent Samples Test

	t-test for Equality of Means						
						95% Confidence Interval of the Difference	
	t	df	Significance P-value	Mean Difference	Std. Error Difference	Lower	Upper
Personal interest	1,438	356	,076	,130	,090	-,048	,307

Table A.33: *Result of independent two-sample t-test for STEM parental background and personal interest and passion*

Independent Samples Effect Sizes

				95% Confidence Interval	
		Standardizer[a]	Point Estimate	Lower	Upper
Personal interest	Cohen's d	,853	,152	-,056	,360

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.

Table A.34: *Effect size for parental STEM background and personal interest and passion*

B

Program Categorization

B.1 Technical and Natural Sciences

- TIKEL: KEMITEKNIK, HÖGSKOLEINGENJÖR 180 hp
- TKKEF: KEMITEKNIK MED FYSIK, CIVILINGENJÖR 300 hp
- TKKMT: KEMITEKNIK, CIVILINGENJÖR 300 hp
- TKTFY: TEKNISK FYSIK, CIVILINGENJÖR 300 hp
- TKTEM: TEKNISK MATEMATIK, CIVILINGENJÖR 300 hp
- TKBIO: BIOTEKNIK, CIVILINGENJÖR 300 hp
- TKMED: MEDICINTEKNIK, CIVILINGENJÖR 300 hp
- TKGBS: GLOBALA SYSTEM, CIVILINGENJÖR 300 hp

B.2 Information and Communication Technology

- TIDAL: DATATEKNIK, HÖGSKOLEINGENJÖR 180 hp
- TKDAT: DATATEKNIK, CIVILINGENJÖR 300 hp
- TKITE: INFORMATIONSTEKNIK, CIVILINGENJÖR 300 hp

B.3 Engineering and Industrial Design

- TIDSL: DESIGN OCH PRODUKTUTVECKLING, HÖGSKOLEINGENJÖR 180 hp
- TKDES: TEKNISK DESIGN, CIVILINGENJÖR 300 hp

- TIMAL: MASKINTEKNIK, HÖGSKOLEINGENJÖR 180 hp
- TKMAS: MASKINTEKNIK, CIVILINGENJÖR 300 hp
- TIELL: ELEKTROTEKNIK, HÖGSKOLEINGENJÖR 180 hp
- TKELT: ELEKTROTEKNIK, CIVILINGENJÖR 300 hp
- TKAUT: AUTOMATION OCH MEKATRONIK, CIVILINGENJÖR 300 hp
- TIMEL: MEKATRONIK, HÖGSKOLEINGENJÖR 180 hp

B.4 Business and Management

- TIEPL: EKONOMI OCH PRODUKTIONSTEKNIK, HÖGSKOLEINGENJÖR 180 hp
- TKIEK: INDUSTRIELL EKONOMI, CIVILINGENJÖR 300 hp
- TAFFS: AFFÄRSUTVECKLING OCH ENTREPRENÖRSKAP INOM SAMHÄLLSBYGGNADSTEKNIK 180 hp
- TSILO: INTERNATIONELL LOGISTIK 180 hp

B.5 Civil and Architectural Engineering

- TISAM: SAMHÄLLSBYGGNADSTEKNIK, HÖGSKOLEINGENJÖR 180 hp
- TKSAM: SAMHÄLLSBYGGNADSTEKNIK, CIVILINGENJÖR 300 hp
- TKARK: ARKITEKTUR 300 hp
- TKATK: ARKITEKTUR OCH TEKNIK, ARKITEKT/CIVILINGENJÖR 300 hp

B.6 Other Programs

- TISJL: SJÖINGENJÖR 180 hp
- TSJKL: SJÖKAPTEN 180 hp

C

Survey Questions

Enkätstudie om Chalmers-studenters ingenjörsidentitet och utbildningsval

Välkommen till enkätstudie om studenters bakgrund, utbildningsval och ingenjörsidentitet vid Chalmers!

Som en del av mitt pågående masterexamensarbete på Chalmers genomför jag en undersökning om ingenjörsidentitet och de bakomliggande motiven till varför elever väljer ett tekniskt program på Chalmers.

Enkäten är uppdelad i två avsnitt för att fånga olika aspekter av din erfarenhet. I det första avsnittet ber vi dig att dela med dig av din bakgrund och utbildningsval, medan det andra avsnittet fokuserar på din upplevelse av att vara en del av ingenjörsutbildningen på Chalmers.

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Handledare:
Anders Johansson
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* Anger obligatorisk fråga

1. Hur gammal är du? *

   Markera endast en oval.

   - 18-20
   - 21-24
   - 25-34
   - 35+

2. Kön *

Markera endast en oval.

- Man
- Kvinna
- Annat
- Vill ej svara

3. Vilken program läste du på gymnasiet? *

Markera endast en oval.

- Naturvetenskapsprogrammet
- Teknikprogrammet
- Samhällsvetenskapsprogrammet
- Ekonomiprogrammet
- Humanistiska programmet
- Estetiska programmet
- Övrigt: ______________________

4. Har du läst tekniskt basår? *

Markera endast en oval.

- Nej
- Ja, på Chalmers
- Ja, på annan högskola/universitet

5. Vilken program läser du på Chalmers? *

Markera endast en oval.

- TAFFS : AFFÄRSUTVECKLING OCH ENTREPRENÖRSKAP INOM SAMHÄLLSBYGGNADSTEKNIK 180 hp
- TIKEL : KEMITEKNIK, HÖGSKOLEINGENJÖR 180 hp
- TISAM : SAMHÄLLSBYGGNADSTEKNIK, HÖGSKOLEINGENJÖR 180 hp
- TIDAL : DATATEKNIK, HÖGSKOLEINGENJÖR 180 hp
- TIELL : ELEKTROTEKNIK, HÖGSKOLEINGENJÖR 180 hp
- TIEPL : EKONOMI OCH PRODUKTIONSTEKNIK, HÖGSKOLEINGENJÖR 180 hp
- TSILO : INTERNATIONELL LOGISTIK 180 hp
- TISJL : SJÖINGENJÖR 180 hp
- TIMAL : MASKINTEKNIK, HÖGSKOLEINGENJÖR 180 hp
- TIMEL : MEKATRONIK, HÖGSKOLEINGENJÖR 180 hp
- TSJKL : SJÖKAPTEN 180 hp
- TIDSL : DESIGN OCH PRODUKTUTVECKLING, HÖGSKOLEINGENJÖR 180 hp
- OSPECIFIKT HÖGSKOLEINGENJÖRSPROGRAM 180 hp
- TKARK : ARKITEKTUR 300 hp
- TKATK : ARKITEKTUR OCH TEKNIK, ARKITEKT/CIVILINGENJÖR 300 hp
- TKAUT : AUTOMATION OCH MEKATRONIK, CIVILINGENJÖR 300 hp
- TKBIO : BIOTEKNIK, CIVILINGENJÖR 300 hp
- TKMED : MEDICINTEKNIK, CIVILINGENJÖR 300 hp
- TKDAT : DATATEKNIK, CIVILINGENJÖR 300 hp
- TKELT : ELEKTROTEKNIK, CIVILINGENJÖR 300 hp
- TKGBS : GLOBALA SYSTEM, CIVILINGENJÖR 300 hp
- TKIEK : INDUSTRIELL EKONOMI, CIVILINGENJÖR 300 hp
- TKITE : INFORMATIONSTEKNIK, CIVILINGENJÖR 300 hp
- TKKEF : KEMITEKNIK MED FYSIK, CIVILINGENJÖR 300 hp
- TKKMT : KEMITEKNIK, CIVILINGENJÖR 300 hp
- TKMAS : MASKINTEKNIK, CIVILINGENJÖR 300 hp
- TKSAM : SAMHÄLLSBYGGNADSTEKNIK, CIVILINGENJÖR 300 hp
- TKDES : TEKNISK DESIGN, CIVILINGENJÖR 300 hp
- TKTFY : TEKNISK FYSIK, CIVILINGENJÖR 300 hp

- TKTEM : TEKNISK MATEMATIK, CIVILINGENJÖR 300 hp
- OSPECIFIKT CIVILINGENJÖRSPROGRAM 300 hp

6. Vilken läsår på ditt program läser du just nu?

Markera endast en oval.

- Läsår 1
- Läsår 2
- Läsår 3
- Läsår 4-5

7. Vad har din ena förälder/vårdnadshavare för utbildningsbakgrund? *

Markera endast en oval.

- Högst gymnasieexamen
- Yrkeshögskola efter gymnasiet (1-2 år)
- Högskoleutbildning på minst 3 år
- Vet ej/Ej aktuellt

8. Vad har din andra förälder/vårdnadshavare för utbildningsbakgrund? *

Markera endast en oval.

- Högst gymnasieexamen
- Yrkeshögskola efter gymnasiet (1-2 år)
- Högskoleutbildning på minst 3 år
- Vet ej/Ej aktuellt

9. Har någon av dina föräldrar/vårdnadshavare läst en högskoleutbildning inom naturvetenskap, teknik eller matematik? *

Markera endast en oval.

- Båda
- Endast pappa/manlig vårdnadshavare
- Endast mamma/kvinnlig vårdnadshavare
- Ingen
- Vill ej svara

10. Var kommer dina föräldrar/vårdnadshavare ursprungligen ifrån? (Svara flera ifall inte samma) *

Markera alla som gäller.

- [ ] Sverige
- [ ] Nordiskt land utanför Sverige
- [ ] Land i Europa utanför norden
- [ ] Land i Asien
- [ ] Land i Afrika
- [ ] Land i Nordamerika
- [ ] Land i Sydamerika
- [ ] Land i Oceanien
- [ ] Övrigt: ____________________

11. Vilken påverkan tror du att dina föräldrars utbildningsbakgrund hade för ditt val av att söka till din nuvarande utbildning? *

Markera endast en oval.

	1	2	3	4	5	
Inge	◯	◯	◯	◯	◯	Väldigt stor påverkan

12. Gällande föregående fråga, motivera gärna på vilket sätt det påverkade ditt val?

13. Hur stor påverkan har dina personliga intressen och passioner haft för valet av ditt program? *

Markera endast en oval.

	1	2	3	4	5	
Inte	◯	◯	◯	◯	◯	Väldigt viktigt

14. Har du deltagit i någon/något av följande aktiviteter? (Anordnat av tekniska högskolor/universitet/företag)

Markera alla som gäller.

- ☐ Tävlingar i grundskolan (T. ex. Teknikåttan, Rädda ägget, Tekniktävlingen)
- ☐ Tävlingar i gymnasiet (T. ex. Unga forskare, Blixtlåset, Olympiader)
- ☐ Matematikstöd (T. ex. Intize, Mattecentrum)
- ☐ Sommarforskarskola
- ☐ Studiebesök på teknikföretag
- ☐ Studiebesök på Chalmers
- ☐ Studiebesök på annan högskola/universitet
- ☐ Nej, inte deltagit i något av dessa
- ☐ Övrigt: ____________________

15. Gällande föregående fråga, Till hur stor grad har aktiviteterna varit en bidragande faktor till att du valt din nuvarande utbildning?

Markera endast en oval.

	1	2	3	4	5	
Väld	◯	◯	◯	◯	◯	Väldigt stor påverkan

Ingenjörsidentitet

16. Varför valde du att studera ett program på Chalmers?

17. När du sökte till Chalmers, hur viktigt var Chalmers anseende/rykte när du valde ditt program? *

Markera endast en oval.

	1	2	3	4	5	
Inte	◯	◯	◯	◯	◯	Mycket viktigt

18. Hur mycket håller du med om följande påståenden?

Markera endast en oval per rad.

	Håller inte med alls	Håller inte med	Neutral	Håller med	Håller med helt
Jag känner mig som en ingenjör just nu	◯	◯	◯	◯	◯
Jag tror jag kommer känna mig som en ingenjör i framtiden	◯	◯	◯	◯	◯
Jag ser mig själv som en ingenjör	◯	◯	◯	◯	◯
Mina föräldrar ser mig som en ingenjör	◯	◯	◯	◯	◯
Jag tycker om att lära mig mer om ingenjörsämnena	◯	◯	◯	◯	◯
Jag känner att jag tillhör ingenjörsområdet	◯	◯	◯	◯	◯
Jag känner att jag förstår kurserna jag läser	◯	◯	◯	◯	◯
Jag kan prestera bra på mina tentor	◯	◯	◯	◯	◯
Andra kommer till mig när det gäller ingenjörsfrågor	◯	◯	◯	◯	◯

19. Hur intressanta är följande ingenjörsområden för dig?

Markera endast en oval per rad.

	Inte alls intressant	Inte särskilt intressant	Neutral	Ganska intressant	Mycket intressant
Hållbar utveckling	◯	◯	◯	◯	◯
Industrin	◯	◯	◯	◯	◯
Forskning	◯	◯	◯	◯	◯
Internationellt arbete	◯	◯	◯	◯	◯
Produktion	◯	◯	◯	◯	◯
Produktutveckling	◯	◯	◯	◯	◯
Tekniskt arbete	◯	◯	◯	◯	◯
Ekonomi/managment	◯	◯	◯	◯	◯

20. Hur viktiga är följande faktorer för att du ska vara nöjd med din framtida karriär?

Markera endast en oval per rad.

	Inte alls viktigt	Inte särskilt viktigt	Neutral	Ganska viktigt	Mycket viktigt
Lön och förmåner					
Bli känd					
Hjälpa andra medmänniskor					
Arbeta med människor					
Leda människor					
Uppfinna/designa saker					
Utvecklingsmöjligheter inom jobbet					
Att utveckla nya kunskaper och färdigheter					
Att ha bra balans mellan arbetsliv och fritid					

21. Vad vill du arbeta med i framtiden?

____

D

Survey Email Introduction

CHALMERS

Webbversion

Enkätstudie om Chalmers-studenters ingenjörsidentitet och utbildningsval

Välkommen till enkätstudie om studenters bakgrund, utbildningsval och ingenjörsidentitet vid Chalmers!

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Till enkäten

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