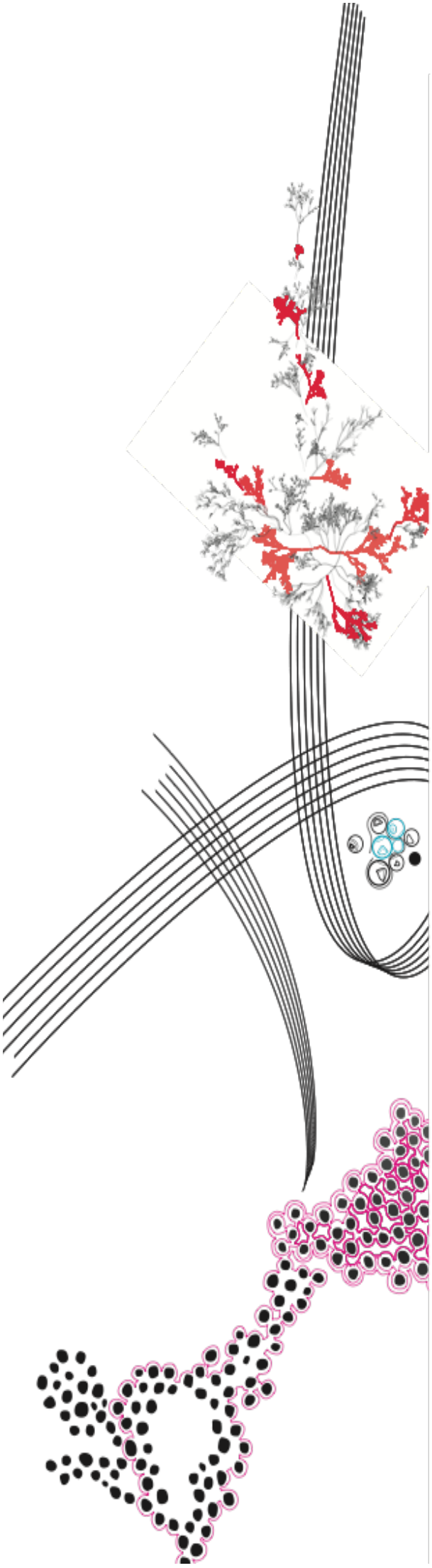

“Prestatiedrang, rode lippenstift en vrouwonvriendelijke grappen”

An interview based study into choices of female graduate students to pursue a university STEM study

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Abstract

In the last decade a great deal is being written and said about the underrepresentation of women in Science, Technology, Engineering and Mathematics (STEM). As research reveals only 24.9% of high school female students choose a STEM study in the Netherlands (VHTO, 2018). Different authors have researched possible explanations for this underrepresentation. To nuance this research into understanding why female students choose STEM studies we explore factors that influence the choices of female graduates students to pursue a university STEM study and possible occupation in STEM. This article draws from previous theories and research on the underrepresentation of women in STEM to develop the theoretical framework. The theoretical framework defines 3 groups of influential factors. These groups are the lack of interest of female students in STEM subjects, the cognitive stereotyping of gender and the perceptions about gender supportive workplace culture. Through the use of interviews with female graduate students at the University of Twente 13 factors can be perceived as influential. Results reveal that perceived influential factors can be social influencers as parents and teachers, events organized by the university, role models, stereotyping based on gender, the endorsement of communal characteristics and the cognitive and personal traits of female students.

Keywords: women in STEM, interest female students, stereotyping, supportive workplace culture, self-concept

Management summary

In recent years the number of female students choosing technical subjects during high school has increased. However the choice for a university study in Science, Technology, Engineering and Mathematics (STEM) among high school female students has not increased at the same rate. Different authors have researched this phenomenon and proposed different possible explanations for the underrepresentation of female students in STEM studies. One explanation can be the lack of interest among high school female students in STEM subjects. Another reason can be the cognitive stereotyping of men and women and their perceived fit with STEM studies. Research also explains that the perceptions about gender supportive workplace culture can have an effect on representation of female students in STEM. However research shows that female students hold contradictory viewpoints on influential factors (Powell, Dainty & Bagilhole, 2012). Therefore we wonder which factors are of influence for Dutch female university students. In addition, in last decade the government has subsidised projects and organisations that focus on attracting and retaining female student to STEM studies. Furthermore, throughout the years the equality between men and women has received a lot of attention and for example last years events in Hollywood (#metoo) fired up a new debate about female emancipation and the position of women at work. Therefore, the aim of this study is to explore if a nuance in the explanations of influential factors for female graduate students in The Netherlands is present. This can provide an understanding of the underrepresentation of female students in STEM studies. Therefore the research question is: Which factors influence the choices of female graduate students to pursue a university study and possible occupation in STEM? To answer this question a qualitative research method is used. 19 female graduate students of the University of Twente have been interviewed to get a deeper understanding of factors that influenced them to choose a STEM study and possible occupation. The influential factors that have been found are based on the experiences, feelings and stories of the participants.

Results reveal that social influencers as parents and teachers, school events as open days/student-for-a-day-programmes and role models can positively influence the interest of female students in STEM fields. It was striking to observe that female students also encountered negative influencers. For example perceptions about agentic and communal characteristics, stereotypical jokes and the disbeliefs about the knowledge, skills and abilities of female students were influential. With all the attention for equality throughout the years we did not expect that these perceptions about gender cognitive difference were still present. It was also observed that when a study programme endorses characteristics that are more present with women it could positively influence female students to pursue a STEM university study. Having a life partner, separation of work and private life, diversity of study and workplace and the set example by parents have an influence on thoughts about gender supportive workplace culture and what female students find relevant for their future. Besides these reasons results have revealed that the self-concept of female students could be perceived as influential in the pursued of a STEM study and possible occupations.

The results initiate certain recommendations for high schools, universities, companies and the government. For these organizations it is recommended to stimulate the confidence of female students. A higher self-concept of female students can positively influence the choice for university STEM studies and possible occupations. Another recommendation is that female students can serve as role models for future generations. Furthermore, STEM subjects, study programmes and occupations should be effectively tailored to interest both men and women.

Table of content

1. Introduction

Recent research has revealed that the number of high school female students choosing technical subjects during high school is increasing. In the school year 2006/'07 3% of the pre-university high school female students chose a profile with technical subjects while in 2016/'17 this was 27,3% (CBS, 2018). An explanation for this increase can be that the Dutch government has provided subsidies to stimulate female students in pursuing a Science, Technology, Engineering and Mathematics (STEM) study or occupation (Rijksoverheid, 2013). Although a strong increase is present at high schools, the choice for a university STEM study among female students is not increasing at the same rate. Between 2012 and 2017 the number of high school female students choosing a STEM study only increased with 3% (VHTO, 2018). For high school female students the most popular university STEM studies are Life science and Technology, Biology, Biomedical technology, Pharmacy and Medical sciences. However, the largest STEM studies are Mechanical Engineering, Biology, Applied Physics, Computer Science, Business and IT, Electrical Engineering and Aerospace Engineering (VHTO, 2018). These statistics show that female students choose university STEM studies that have a perceived focus on health, the human body, medicine, ethics and/or aesthetics. As prior research describes female students are more attracted to studies that focus on these aspects (Van Griethuijsen, 2015; Sjøberg & Schreiner, 2010). That STEM studies do not endorse the characteristics female students find interesting and relevant can be one of the explanations for the underrepresentation of female student in STEM studies (Booy, Jansen, Joukes & van Schaik, 2012). Another explanation can be that the largest STEM studies are mostly male dominant, which influences the decisions of female students. The underrepresentation of women in STEM studies is also visible in the graduation rates. In total 22.900 female students graduated in the school year 2015/'16 and of those female students only 25.5% achieved a master degree in a technical university study (Onderwijs in Cijfers, 2017). Research also revealed that this underrepresentation continuous within STEM work fields. The Dutch Central Bureau of Statistics (CBS) states that among young highly educated female students only 30% of technical educated students work in their educated fields (CBS, 2016). This makes us wonder how STEM studies and occupations differ from other studies and occupations and why female students are underrepresented in these fields.

The Occupational Information Network (O*Net) database specifies a set of occupational competencies required for a certain occupation. The O*Net database has information regarding knowledge, skills, abilities, work values and work interest. Based on these different cognitive and personal traits information can be acquired about which competencies fit with a certain work field (Calnevale, Smith & Melton, 2011). For STEM work fields these competencies are for instance knowledge about computer and electronics. This is the knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including the applications and programming. This type of knowledge is for 80% very to extremely important in STEM occupations. While this knowledge is transferable across different occupations it is heavily concentrated in this work field compared to direct competitors as managerial, professional and healthcare occupations. Another competency that is required is the mathematical knowledge, which is the knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications. While this knowledge is transferable across work fields it is for 55% very to extremely important in STEM fields compared to 31% for direct competitors. Important skills competencies are the complex problem solving, critical thinking and active learning and practical skills of mathematics and science. While these can also be found more frequently in other fields, occupational skills are most useful when they fit a certain knowledge domain. Abilities are even more generic and transferable across occupations and examples are mathematical and deductive reasoning. For example mathematical reasoning is for 35% very to extremely important for STEM fields compared to 15% for direct competitors. The O*Net database

also states personal traits that fit with STEM work fields. Relevant work values are achievement, independence and recognition. Relevant work interest can be realistic and investigative thinking.

While these competencies do not indicate that one gender group should be better at it than the other a differences is present in pursuing university STEM studies and possible occupations. Multiple authors tried to explain why so few female students choose STEM studies (Ceci, Ginther, Kahn & Williams, 2014; Hill, Corbett & St Rose, 2010; Booy et al., 2012). In general three themes emerge from the literature about reasons for the underrepresentation of women in STEM studies. The first explanation is the interest female students have in STEM educations. Second is the cognitive difference between men and women and the perceptions about who posses the competencies needed for STEM studies and occupations. Third are the perceptions about gender supportive workplace culture at schools and companies. However, are these the only factors that influence female students in pursuing a STEM study and occupation? Or are there other factors that play a role during the study choices of female students. In recent years the equality between men and women at work received a lot of attention and for example the events in Hollywood last year fired up the debate about stereotyping and behaviours towards and treatment of women. One might wonder if the attention for female equality influenced female students perceptions about their possibilities within a male dominant field as STEM. As Powell, Dainty and Bagilhole (2012) point out female student can hold contradictory viewpoints on which factors influenced them. Therefore, to nuance the explanations found in previous research the research question of this paper is: Which factors influence the choices of female graduate students to pursue a university study and possible occupation in STEM?

In the next chapter we provide a theoretical framework of constructs that could explain the underrepresentation of females students in STEM studies. In chapter 3 we explain why we used an interview-based approach, why we choice this sample and how we analysed the results. In chapter 4 we reveal the findings. In chapter 5 we discuss the findings and also explain the limitations and practical recommendations. The last chapter, chapter 6 will contain the conclusion of this research.

2. Theoretical framework

Social influencers and childhood experiences

Previous research reveals that different factors can influence female students to pursue studies and occupations in STEM (Powell et al., 2012; Yeager & Dweck, 2012; Lidemann, Britt & Zundl, 2016). Powell et al. (2012) surveyed 656 college students (23,3% female) of a UK university about factors that influenced them in choosing a career in Engineering & Technology (E&T). The findings point out that social influencers, knowledge of the sector and subject abilities are important factors in career choices. Social influences can be related to the influence of childhood experiences, parents and teachers. The Dutch Attitude Measure Science and Technology analyses social influences that influence female students to choose science and technology. At early stages in their lives female students are exposed to all kinds of implicit and explicit perceptions about science and technology as an exclusive male field (VHTO, 2016). These perceptions can influence what the hobbies and interest are of children and as Powell et al. (2012) have found 37.9% of female students and 62.3% male students are influenced by their hobbies and interest to pursue a career in E&T fields. In addition, the knowledge of the sector is often gained through family or friends working in the sector. When parents and teachers teach children that intelligence can expand with learning and experience research explains that adolescent female students can perform better. Moreover, to increase achievement in math the focus should be on commitment and hard work instead of on a fixed mind-set about the role of the gender (Yeager & Dweck, 2012). To further investigate Good and colleagues have researched the environment in a classroom of an elite university during a semester of a calculus class (Good, Rattan & Dweck, 2009). The results reveal that when the focus is on a growth mind-set less negative

stereotypes were presents. Female students also had a higher intention to pursue math classes and were more interest in the subject compared to female students who experienced negative stereotypical behaviours of teachers and peers. The authors conclude that when math can be acquired female students had a high sense of belonging in math and the intentions to pursue it in the future.

Lindemann et al. (2016) have done research among 374 undergraduate female students about the STEM major selection and persistence to pursue a career in STEM. In line with the ideas of Good et al. (2009) the results expose that institutional factors could play an important role. Female students indicate that the lectures were giving to 200-300 people at a time and this could exacerbate issues associated with the minority of female students in a male dominant study. The feeling of not fitting in and not being smart enough was a big problem for these female students and the large classroom prevented them of communicating with their teachers. When teacher gave female students the opportunity to join small programmes that focused on learning STEM subjects, in combination with teaching a growth mind-set, the responses of female students were much more positive (Lindemann et al., 2016). In line with this research prior results reveal when one third of the minority is represented the minority can have a full influence on the culture. When the number is smaller than one third it can have a negative effect on the performance and enjoyment of the minority (Kanter, 1977).

Perceptions about female students and the endorsement of communal characteristics in STEM fields

Other factors that can influence the study choices of female students are the perceptions about female students and the endorsement of communal characteristics within STEM fields. Women are perceived as having mostly communal characteristics. They are more concerned with others welfare and characteristics are affectionate, helpful, kind, sympathetic, interpersonally sensitive, nurturing, and gentle (Diekman, Brown, Johnston & Clark, 2010). Men are perceived as having more agentic characteristics. They are primarily assertive, controlling, and self-orientated and the characteristics are aggressive, ambitious, dominant, forceful, independent, self-sufficient, self-confident, and prone to act as a leader (Eagly and Karau, 2002; Diekman et al., 2010). Medera, Helb and Martin (2009) have researched 642 letters of recommendations of 194 applicants for junior faculty positions of an American university between 1998 and 2006. The study reveals that female applicants are more described with communal characteristics and male applicants with agentic characteristics. This suits the perception that women are perceived as having mostly communal characteristics. Different authors have explained that female students perceive STEM as not endorsing communal characteristics and that this can influence their choices for a study and occupation (Lindemann et al., 2016; Diekman, Clark, Johnston, Brown & Steinberg, 2011). The research of Diekman et al. (2011) among 75 psychology students states that STEM careers were perceived as less likely in fulfilling communal characteristics. In the second research of Diekman et al. (2011) among 241 psychology students (143 women) the results assert that when the focus is on a growth mind-set as mentoring and working in groups during science and math classes, the school subjects endorsed more communal characteristics. This positively influenced the perceptions of female students about STEM subjects.

Besides analysing letters of recommendations Medera et al. (2009) also invited six psychology professors to rate 125 letters of recommendations without knowing the name, school and gender of the applicant and the recommender. The results expose a negative relationship between communal characteristics and hiring the applicants. Besides that communal characteristics mediate the relationship between gender and the admission of applicants. For agentic characteristics no effect has been significant, this could be because agentic characteristics are considered as the norm for applicants and therefore no significant effect was present. Moss-Racusin, Dovidiob, Brescoll, Graham and Handelsman (2012) also have researched the effects of perceptions and the relationship between

gender and stereotypical thinking as Medera et al. (2009). In the research of Moss-Racusin et al. (2012) 127 male and female biology, chemistry, and physics professors of 6 American universities evaluated the application materials of an undergraduate science student. All professors received identical materials of the student expect the name varied, 63 received an application with a male name and 64 with a female name. The researchers have found that the professors consider male applicants as more competent and hireable, deserved more mentoring and deserved a higher salary. The preference for the male student was present with male and female professors. The professors also had to fill in the Modern Sexism Scale to evaluate if the professors held any prejudice against men or women. The results of this part reveal that the professors prefer female students compared to male students. The authors conclude that the professors probably have been influenced by cognitive gender stereotypes and that male students fit better within the picture of a scientist than female students. These beliefs about the capabilities of men and women can influence female graduate students to pursue a study and possible occupation in STEM.

Perceptions about workplace culture

Another factor that can influence occupational choices of female students are the perceptions about gender supportive workplace cultures. This can be influenced by personal experience, shared experiences within their environment and publications about these subjects. For instance the research of Glass, Sassler, Levitte and Michelmore (2013) initiate reasons for why women leave STEM fields at early stages of their career. In their research Glass et al. (2013) have used the NLSY79 on-going panel survey, which followed 12,686 American men and women between 1979 and 2008. The researchers have used a sample of 1258 women who completed a four-year college degree and of these 1258 women 258 worked in STEM fields and 842 in professional/managerial occupations. The authors have found that women in STEM and women in professional occupation marry at similar rates, have similar number of children, earn almost the same salaries and have similar job satisfaction rates. However, the results also reveal that women in STEM work fields are far more likely to leave STEM fields (around 50% after 12 years) compared to professional occupational women leaving professional fields (around 10% after 12 years). Glass et al. (2013) also have researched if women completely leave the labour force or only their current work field. While a difference between women in STEM fields and professional occupations in leaving the labour force was hardly present (2,7% for STEM fields compared to 2,2% for professional fields), the leave out of the work field exposed a different story. Around 31,5% of women moved out their STEM work fields while only 6% of women moved out their professional fields. The question that comes to mind is where did these women go? An explanation can be that women in these fields move up the ladder to more managerial and professional functions. However, results have indicated that only 21% moved to managerial or administrative ranks, 6% to health professions and 11% to teaching, the fast majority (around 50%) moved to non-professional jobs. An explanation could be that moves to other fields happen during the early careers of women when management promotions are unlikely.

Glass et al. (2013) have tried to find clues for why women leave STEM fields. One clue is that the struggles women face in STEM fields does not disappear at higher levels of skills or maturity, while the disappearing of struggles seems to be the case for professional women. Furthermore, the results explain that advanced training, increased job tenure, job satisfaction and aging do not increase the commitment and retention of women in STEM fields. Another clue is that when the spouse of women in STEM fields also has an occupation in STEM it decreases the number of women leaving STEM, while leaving STEM fields has ben initiated when the spouse works in non-STEM fields. These issues seem irrelevant for women with professional occupations where these patterns did not appear. Besides that, family characteristics as postponing family obligations were more significant

issues for women in STEM compared to women in professional occupations. However, many women left STEM fields before even thinking about marriage and children and are not old enough for job tenure and maturity to be of any relevance. Therefore it can be that these factors are of no significance for graduate students of university but that other perceptions about workplace culture influence their decisions.

Table 1 represents the theoretical framework that guides this study. Based on the literature review the 3 main constructs are the lack of interest of female students, the stereotyping about gender cognitive difference and the gender supportive workplace culture. The lack of interest of female students can be affected by social influences as parents, teachers and traditional or conventional childhood experiences. The stereotyping about gender cognitive differences can be influenced by perceptions about who fits STEM occupations. These perceptions are based on the difference between agentic and communal characteristics of men and women. The gender supportive workplace culture can be affected by perceptions about work-life balance. The dimensions of this construct are perceptions about postponing marriage and having children, perceptions about job tenure and perceptions about job satisfaction.

Table 1 Overview of main factors influencing study and possible occupation choices of women

Constructs	Factors affecting the construct	Dimensions of constructs
Lack of interest in STEM (Dweck et al., 2009; Lindemann et al., 2016)	Social influencers (Powell et al., 2012)	Parental influence Teachers influence Traditional or conventional childhood experiences (Powell et al., 2012)
Stereotyping about gender cognitive differences (Moss-Racusin et al., 2012; Medera et al., 2009)	Men fit better with STEM occupations (Medera et al., 2009; Diekman et al., 2010;Eagly & Karau, 2002)	Perceptions about agentic characteristics of men (aggressive, ambitious, dominant, forceful, independent, self-sufficient, self-confident, act as a leader) Perceptions about communal characteristics of women (affectionate, helpful, kind, sympathetic, interpersonally sensitive, nurturing and gentle) (Eagly & Karau, 2002; Diekman et al., 2010)
Gender supportive workplace culture (Glass et al. 2013)	Perceived work place culture in supporting gender based work-life balance (Glass et al., 2013)	Perceptions about postponing marriage and having children in favour of having STEM occupations Perceptions about perceived job tenure Perceptions about job satisfaction (Glass et al., 2013)

3. Methods

The aim of this qualitative research is to explore which factors influence the choices of female graduate students to pursue a university study and possible occupation in STEM. We used an exploratory research to discover nuance in the details of the constructs of table 1. Furthermore, we explore the perceptions of female students about the proposed influential factors.

Sample

This study was conducted at the University Twente. The University of Twente stands for high tech, human touch. The university combines fields of expertise in social and technological fields. The university aims to provide answers to society about new questions and problems that arises because of on-going developments in technology (University of Twente, 2018). Therefore, this technical university with a human touch was chosen as the sample university. At the University of Twente female students from different STEM studies were interviewed. The criteria for the selection of female graduate students were based on their gender, study and their willingness to participate. We limited the sample to those who had a STEM education with average of female students below 25% in 2017 (University of Twente, 2018). Namely, research revealed that when a minority is represented by one third of the population they could fully influence a culture (Kanter, 1977). A list of the selected studies for this research can be found in appendix A. This appendix also gives an indication of the difference in representation of male and female students within STEM master studies during the last 5 years. After the studies were selected emails were send to the study advisors of the STEM studies. The study advisor of Applied Mathematics, Computer Science and Electrical Engineering, the programme coordinator of Chemical Engineering and Nanotechnology and a marketing and communication marketer specialized in attracting and retaining female students at the University of Twente forwarded an email to students on our behalf. Based on these forwarded emails 6 female graduate students replied and wanted to participate in the research. These 6 female students assisted in finding 5 more female participants. We also approached students who were listed at the University of Twente LinkedIn page. Via the LinkedIn page we reached out to a total of 32 female students by email and 8 female students were willing to participate in a face-to-face interview. In total we found 19 female gradate students who participated in this research.

Sample characteristics

Of the 19 female students who participated 4 studied Applied Physics of which 1 combined it with the master Applied Mathematics, 5 studied Chemical Engineering of which 1 also participated in the master Nanotechnology, 3 studied Mechanical Engineering, 2 studied Computer Science and 2 studied Nanotechnology. Furthermore, 1 participant was finishing her bachelor mechanical engineering and 1 her bachelor applied physics. 1 participant was an assistant professor with a master's degree in Applied Physics. The respondents came across as kind, caring, ambitious and tried to embrace the student experience. For example half of the respondents were active in boards and committees. These female students participated in a board of their study association or sports club. Some respondents participated in committees of the open days or in events surrounding attracting female students to STEM studies. More than half of the respondents had some experience in STEM work fields via after school jobs or internships. Numerous respondents started or wanted to start a PhD. 1 of the respondents already finished her PhD, 1 just started her PhD and 1 respondent will start this summer. Of the 16 other female students 7 were thinking about starting a PhD after graduation. This decision will depend on experiences gained during their master thesis and/or getting a position offered. Besides that 9 respondents had a life partner of whom 3 of the spouses did not study or work in STEM fields. An overview of the characteristics of the respondents can be found in appendix B.

Data collection

We conducted 19 semi-structured interviews to analyse what the perceptions of female students are and what influences them to pursue a university study and possible occupation in STEM fields. The semi-structured interview technique was used to provide structure and the possibility of comparing between the interviews. The interview technique enabled us to ask open-ended questions for the purpose of gaining new insights and understanding female students viewpoints. In every interview we used topics that were based upon the theoretical framework provided in table 1. As a result we were able to compare the findings of the different interviews (David & Sutton, 2004; Bridges, Gray, Box & Machin, 2008; Doody & Noonan, 2013). Within the semi-structured interview we were free to chance the order and wording of the questions depending on the direction of the interview (Doody & Noonan, 2013). It also made an open nature and a conversational style of questions possible where depth and validity could be encouraged (Hand, 2003; Deamley, 2005). Prior to the interviews the interview guide was studied and practiced. An overview of the interview guide can be found in appendix C. The 19 interviews were conducted between February 2018 and April 2018. All interviews had a duration of approximately 45 minutes to an hour making in total 17,5 hours of recordings. Of these 19 interviews 16 where set as a face-to-face interview in a reserved room at the University of Twente or at quiet moments in the school cafeteria. Two interviews were conducted via Skype because the female students were not able to meet in person. Lastly, one interview was conducted via the phone because of bad connection via Skype. We wanted to interview the female students in a surrounding they knew and where they were confortable to tell their story and therefore the university of Twente was chosen. The rehearing and transcribing of the interviews enable us to improve as an interviewer. We were learned to ask more probing questions to increase the depth and validity the interviews. Some respondents mentioned experiencing the probing technique during their interview, which gave us the validation that our performance is a process and that it improved.

Data analysis

The data was analysed according to the content analysis method. The content was gathered via records of the interviews and transcribed verbatim. Before analysing the transcripts keywords were written down which where based on our observations during the interviews and the transcription of the interviews. The analysis of these transcripts was conducted in two phases. During the first phase a deductive approach was used and the transcripts were coded descriptively. The descriptive codes were based on the constructs from theoretical framework. The second phase was an inductive approach where the transcripts were coded based on specific aspects in the texts. During this stage ATLAS.ti 8.0 was used to verify if codes were present that did not emerge in the previous phase. Based on this second analysis an extra construct and extra perceived factors emerged from the transcripts. To strengthen the validity of the research the findings were presented and discussed with the communication and marketing marketer who is specialised in attracting and retaining female students in STEM studies at the University of Twente.

4. Findings

The analysis of the interviews revealed 13 factors that can be perceived as influential for female students to pursue a university STEM study. However as initiated by prior research female students have different viewpoints on which factors are influential for them. Within this research the different viewpoints of female students on perceived influential factors is present and explained. The 13 factors can clarify the nuance in the details of the theoretical framework in table 1. Besides the 3 constructs mentioned in the theoretical framework a new construct was found during the analysis of the interviews. This construct is the cognitive and personal traits of female students. The categorization of

this chapter is based on the 13 factors. The 13 factors will be explained and highlighted with quotations from the interviews.

1. Roots are in the family

The respondents were asked if their parents had an influence on their choice for a STEM study. All respondents agreed that they were able to make their own choices and that their parents supported their decisions.

'Niet zozeer op mijn studie keuze maar ze hebben me wel altijd gewoon gesteund in welke keuze ik wilde en ze zijn gewoon vooral heel trots omdat ik dus universiteit doe.' (Respondent 15)

[Not so much on my study choice but they always supported me in my decisions and they are in particular very proud because I study at a university]

All respondents mentioned that their parents encouraged them to participate in a study they preferred.

Dat was gewoon van leuk en je moet doen wat je leuk vind. Het was niet van zou je dit of dit gaan doen. ze gingen wel mee naar open dagen als ik dat wilde en vragen stellen bijvoorbeeld of er genoeg banen in waren maar niet echt sturen in welke richting dat niet. (respondent 14)

[It was just fun and you should do what you prefer. It was not that they proposed studies. They came along to open days when I wanted that and asked questions for example if there were enough job opportunities with a certain study. They did not pushed me in a direction or something.]

Moreover some respondents stated that their parents had an influence on their personal interested. In line with the research of Dweck (2005) and Powell et al. (2012) some respondents mentioned that their parents positively encouraged them to pursue technical subjects.

'Maar ik denk wel dat zeker mijn moeder, maar ook mijn vader invloed heeft gehad op dingen die ik interessant vind.' (respondent 5)

[However I think that my mother but also my father had an influence on things I find interesting]

'Mijn ouders hebben vaak gezegd je bent goed in wiskunde en hebben me heel erg geprikkeld op een ander vlak waardoor ik daar mijn ei in kwijt kon en mijn ouders hebben mij ook altijd op middelbare school bevestiging gegeven dat is goed was wiskunde.' (respondent 10)

[My parents told me often that I was good in mathematics and really stimulated me in other fields in which I could be myself. My parents always confirmed that I was good at mathematics during high school]

The quotation below reveals an aspect that was common among the respondents. Namely, with half of the respondents their father or mother had a STEM background. In the research of Powell et al. (2012) it was also suggested that female students gained the knowledge about STEM studies through friends and family.

'Mijn vader heeft hier vroeger ook informatica gestudeerd en die was wel vanaf jongs af aan toen ik het nog niet in de gaten had bezig met mij te stimuleren en mij niet alleen maar meisjes speelgoed te geven. Ik speelde ook met Xnex, auto's en met lego zo probeerde hij het zo wel een beetje te stimuleren.' (Respondent 7)

[My father also studied computer science here and from an early age he was trying to stimulate by not only giving me girls toys. This happened without me knowing it. I also played with Xnex, cars and Lego and in that way he tried to stimulate my interests.]

With the following respondent her upbringing has an influence on how she wants to be as a parent in the future.

'Wat ik wel jammer vond is dat als ik soms helemaal gefascineerd was van iets natuurkundigs dan snapten ze dat eigenlijk niet en gingen ze daar niet echt op in. Ik zou het anders doen als ik een kind had, maar ik weet ik ook niet want misschien is mijn kind wel niet technisch. '(respondent 11)

[What I find disappointing is that when I was young I could be completely fascinated with something physical and than my parents did not understand it and did not respond to it. I would do that differently if I had a child, but I do not know because maybe my child does not prefer technical subjects]

2. Schools and teachers are the ones to be watched

High schools teachers

Most of the respondents stated that having a teacher that is enthusiastic, challenges them and understand what students need influenced them in preferring a subject.

'Ik heb goede docenten gehad. Ik had een super toffe scheikunde docent, wiskunde docent die vond mij ook helemaal cool, de natuurkunde docent was een beetje ongemakkelijk maar was ook helemaal tevreden met me. Dus in die zin hebben die mij ook allemaal gepusht en heb ik geen negatieve ervaringen meekregen en vonden ze het juist wel gaaf. ' (respondent 17)

[I had good teachers. I had a cool chemistry teacher; the mathematics teacher really like me and the physics teacher was a little bit awkward but was also completely satisfied with me. So in that way they all pushed me and I did not have any bad experiences and they all found it fantastic.]

'Ik denk hun enthousiasme en ook dat ze uitdagen of zo. Ik had bij heel veel vakken weinig uitdaging wil ik niet zeggen maar je leerde wat er in het boekje staat.' (respondent 16)

[I think that their excitement and also that they challenge you. I had with a lot of subject no real challenge that's not how I want to say it but you learned what was stated in the books.]

However, some respondents had no connection with the teachers of the subject they are now studying.

'Nee, want mijn natuurkunde leraar vond ik verschrikkelijk. Dus heeft niet echt meegeholpen.' (respondent 18)

[No, because I hated my physics teacher. So that did not help.]

In response to the question why this did not influence her to pursue a study in physics the respondent answered:

'Omdat ik heb gemerkt met meeloop dagen en open dagen dat natuurkunde hier echt heel anders is dan op de middelbare school.' (respondent 18)

[Because I noticed during student-for-a-day programmes that physics at the university is completely different than in high school.]

University teachers

Most respondents did not perceive misbehaviour of their teachers at the University of Twente. They did not feel mistreated compared to male classmates. However some respondents shared examples of perceived misbehaviour of teachers at the university of Twente.

'Het ergste was denk ik dat ik een keer een berichtje kreeg van een professor van wie ik college had gehad en toen had ik rode lippenstift op na een college en toen stuurde die achteraf een mail van: 'ik word afgeleid door rode lippenstift in de college zaal'. Er zijn wel meer leraren die heel vriendelijk naar studenten gaan doen en er gebeuren genoeg rare dingen.' (respondent 11)

[I think the worst experience was when I received an email from a professor from which I received a lecture that he was distracted because of my red lips during class. I was wearing red lipstick that day and he send me an email after that lecture. More teachers are really too friendly to students and there happen enough weird things.]

Another respondent had the following experience:

'I did notice that some of the lab teachers did make more eye contact with the boys than with me. So during classes I tried to sit in differently places to see if the teacher was really not making eye contact or if it happened because of the position in class. But 80% of the time he was looking at the men in the class. So when he was explaining it felt like he was only explaining to my male lab partner and that felt like not a nice thing.' (respondent 4)

The respondents who perceived misbehaviour of a teacher or classmate approached it in different ways. For them it was not a reason the quit their studies but it did influence them in feeling at home at the university. For some of the respondents a barrier was present to talk about their experiences and feelings at the university. They mention that the university could be more transparent about the subject and initiate the conversation. Their experiences also influenced them in where they want to go after they graduate. For example respondent 11 will not pursue her PhD at the University of Twente but somewhere else where the professor is more female friendly and the university has more international status. She shared that she would start her PhD at the University at Twente if no other options were available however she is glad that she can go to another university.

3.The pre-university experience of great value for the respondents

One of the previous quotations also entails the importance of open days and student-for-a-day programmes for the respondents. Almost all respondents mention that their choice for a study and university were influenced by the open day and student-for-a programme.

'Tijdens die meeloop dag vond ik het echt super leuk en gezellig en de sfeer was echt top en toen had ik iets van dat gaan we gewoon doen, het voelt gewoon goed.' (respondent 5)

[I really like the student-for-a-day programme and the atmosphere was great and than I thought it was something I just had to do, it felt really good.]

This quotation also entails another aspect most respondents mentioned. Namely, that they base their decisions upon their feelings.

'Eindhoven vond ik geen optie, het was een blok beton en voelde me niet persoonlijk aangetrokken tot de omgeving. Ik heb het vooral op gevoel gebaseerd. En Twente was heel groen en dat vond ik leuk.' (respondent 10)

[Eindhoven was no option for me, it was one chunk of concrete and I did not feel personally attracted to the environment. I mainly based my decision on my feelings. Twente was very green and I like that.]

4. Female STEM role models

Most respondents did not have a specific female STEM role model. However, some respondents mentioned that events organized by the university influenced them in pursuing an occupation in STEM. For example one respondent talked about the event Women in Science where women from STEM fields share experiences and stories of their daily work lives. The respondent mention the following when asked about her experience with Women in Science:

'Eigenlijk is het wel positief, want iedereen verteld ook hoe ze zijn gekomen tot wat ze doen en waarom ze bepaalde dingen juist wel of niet leuk vonden. En iedereen is eigenlijk wel positief en alleen die dingen met zwangerschapsverlof word een keer als negatief ervaren maar verder heb ik nog nooit iemand horen klagen over 'wat een verschrikkelijke mannenwereld'. Ik vind het wel leuk om te horen dat vrouwen verschillende dingen kunnen doen en dat je niet perse in de toepassing van de techniek maar ook management en dat soort dingen. En dat dat ook bij techniek kan horen en wat dat betreft heeft wel invloed gehad.' (respondent 18)

[To tell the truth it was positive, because everybody tells how they came to the point they now are and why like specific things or not. Everybody is positive and only an aspect as maternity leave could be experienced negatively but I never heard women complain that it is 'a terrible men's world'. I liked hearing that women could do different things and that you not necessarily have to be in the application of STEM but you can also do management or something and that also is part of STEM. And looking at that it had a large influence.]

Some respondents mentioned the lack of female STEM role models growing up.

'Ik heb zelf nooit echt zo'n rolmodel gehad, maar ik heb wel het idee dat men er vroeger minder bezig was met er moet een rolmodel zijn. Terwijl dat nu heel erg is en probeer ik zelf ook een rolmodel te zijn voor nieuwe meisjes.' (respondent 7)

[I never had a role model but I do have the feeling that in the past people were not that focused on having role models for girls. While nowadays that is a hot topic and I try to be a role model myself for new girls.]

What the quotation above also entails is that the respondent is trying to be a role model herself for the next generation of students. Almost half of the respondents participated in commissions or events that evolved around female students and STEM. For instance some respondents went to high schools to talk about their experiences at a technical university.

'Ik heb zelf promotielessen via pre-u gegeven en dat is van de Twente Acadamy bij Science on Tour. daarbij ging ik langs scholen om natuurkunde proefjes te doen en elektriciteit proefjes en dat is echt heel leuk want je laat kinderen magische proefjes zien maar je kunt dat natuurkundig uitleggen.' (respondent 10)

[I have given promotion lessons via pre-u and that was from the Twente Acadamy Science on Tour. I went to schools to show experiments during physics classes and that was really fun because you show children magical experiments but you can also explain it with physics.]

The respondent was also asked if she wanted to continue with giving lectures and trying to inspire female students for STEM university studies and occupations. Her answer was:

'Ja ik denk het wel ik vind het wel belangrijk maar misschien voorlichting geven, ik denk wel dat er iets mee ga doen maar alleen als het op mijn pad komt. Ik ga er nu niet actief achteraan.' (respondent 10)

[Yes I think so I think it is important to give lectures, I think I will do something with it but only if it comes along. I will not actively pursue it right now.]

Another respondent mentioned that trying to be a role model already had a positive effect on younger female students.

'Ik had ook wel later bij de volleybal kwam ik een meisje tegen die herkende mij omdat ik ook een jaar dagvoorzitter was geweest en zei van dat ze mijn praatje heel erg leuk vond en daardoor verder was gaan kijken en eerder bij een Technische Natuurkunde was aan gaan kloppen wat ze uiteindelijk is gaan studeren dan wat ze daarvoor had gedaan.' (respondent 17)

[One time when I went for a training with my volleyball team a girl recognized me because I was chairman during the high tech, high tea one year and she said that she really like my speech and that was the reason she looked more at different studies and made the choice for applied physics.]

5. Stereotypical jokes are the same only perceptions differ

All respondents experienced stereotypical jokes within their environment. The interpretation of the jokes is different for every female student. As the following respondent describes:

'Er worden wel grapjes gemaakt van ben je onder de tafel gekropen als je een goed cijfer hebt gehaald en dan kan ik op zich wel hebben maar bij sommige moet je er ook wel mee oppassen maar het gebeurd wel.' (respondent 10)

[Some people make jokes about if you went under the table of the teacher when you have a good grade and in general I can handle it but you also have to be careful with it, but it happens.]

Other female students do not know how to respond to those kinds of comments:

'Het enige lastige is dat ze dan af en toe grappen gaan maken over vrouwen, van die seksistische grappen dan is het af en toe wel lastig van hoe moet je reageren. Je bent namelijk zo erg in de minderheid dat het af en toe wat awkward situaties oplevert.' (respondent 7)

[The difficult part is how to respond when they make jokes about women, those sexual jokes. You are such a minority that it something causes awkward situations.]

'Echt van die super seksistische grapjes als vrouwen horen in de keuken. Echt van dat soort grapjes echt super extreem dat je denkt van ja wat moet ik er mee.' (respondent 14)

[Really those sexual jokes as women belong in the kitchen. Jokes, which are really extreme that you do not know what to do with it.]

Moreover, some of the respondents also experienced these stereotypical jokes during their internships or job.

'Ja hetzelfde gewoon weer met die grapjes het blijft er gewoon in zitten op de een of andere manier. Vandaag nog, was er een vrouwelijke sollicitante geweest en meteen al die mannen op Facebook en toen dacht ik echt doe toch normaal, dit gebeurt ook niet als er een mannelijke sollicitant is. Dat gebeurt niet, maar ze willen gewoon even weten hoe die vrouw er uit ziet. En die vrouw heette Laura, dus toen kreeg je de hele Jan Smit gedoe, dat vond ik zo apart om te zien. En die grappen blijft er ook wel in zitten.' (respondent 3)

[Yes the same jokes it just keeps being part of it in a way. Today there was a female applicant and right away the men went to check her on Facebook and then I thought act normal, this will not happen when it was a male applicant. They just want to know what she looked liked and her name was Laura and they started with jokes and singing the song of Jan Smit, I really found it strange to see. Those jokes is something that will stay.]

6. Need to clarify knowledge, skills, abilities differs per respondent

Half of the respondents mentioned feeling that they have to prove themselves that they posses the knowledge, skills and abilities needed for the study. It was observed that these feelings differs per respondent and one respondent states that it depends on how you are as a person.

'Ik had daar ook niet zo iets van te voren dat ik me moest bewijzen maar meer van het is een makkelijk vak en natuurlijk kan ik daar ook een goed cijfer voor halen. Dat je moet je bewijzen nee dat gevoel heb ik niet, maar ik denk ook dat het heel persoonlijk is en hoe je in elkaar zit.' (respondent 19)

[I did not had the feeling I had to prove myself but more that it was an easy subject and of course I can get a good grade for that. I do not have the feeling you have to prove yourself, but I think it depends on how you are as a person.]

Other female students did have the feeling that they had to prove themselves. However depending on the respondent this feeling of having to prove themselves compared to men varied. For example the following respondents mention their motivation to prove that they are good enough:

'Ja de prestatiedrang, heb ik altijd wel gehad. Ik het is gewoon een uitdaging als iemand zegt het is moeilijk en je kunt het gewoon niet.' (respondent 15)

[Yes the need to succeed, I always had it. It is just a challenge if somebody says that it is difficult and you cannot do it.]

'ik wel vanuit mezelf de drang dat ik me moet bewijzen. Maar niet dat ik minderwaardig word gezien dat niet. Je moet dan wel een bepaald soort druk of bepaald idee hoog houden i.p.v. je ene Jeroen bent en dat is toch anders denk ik. Als ik bijvoorbeeld bij het eerste uur van college was en in de pauze dacht ik het is helemaal niets aan en ik wilde gaan dan valt het op. Die docent denkt dat meisje die daar zat is weg en die docent weet dat. Dat soort dingen en ik denk dat ik die druk meer mezelf oplegde dan dat het ook echt zo is. Maar zo voelde het. (respondent 16)

[I personally have the urge to prove myself but I do not have the feeling I am seen as less. You have to keep up some kind of appearance compared to just a boy like 'Jeroen'. If you are for instance present during the first hour of the lecture and during the break you think that you do not like the lecture and you want to go than it will be notice sooner. The teacher noticed when that one girl is gone. With examples like that and I think I put that pressure more on myself than that it is really present. But that is what it feels like.]

The following quotations explain that respondents had the feeling that they were not taking serious before proving that they possessed the knowledge and skills needed for the courses.

'Tijdens de studie zelf kennen de mensen je wel een beetje of zien ze dat je goede cijfers haalt en dan word je wel serieus genomen, als je je bewezen hebt.' (respondent 11)

[During the study people know you and they see that you get good grades and than you will be taken serious, after you have proven yourself.]

'Maar ik heb wel het idee dat je jezelf meer moet bewijzen dat je echt kennis van zaken moet aantonen dan als ik misschien een man was geweest. Dat kan ik me wel voorstellen.' (respondent 7)

[I do have the idea that you have to prove yourself more and show that you have the knowledge compared to men. I can imagine that.]

In line with the research of Lindemann et al. (2016) some respondents mentioned the feeling of not fitting in or not wanting to look stupid in front of teachers and classmates when having questions.
'Bijvoorbeeld we hebben nu een vak fysische materiaalkunde. En de docent daarvan die gaf ons dus het gevoel dat we dom waren en dan heb ik nu wel zoiets van stel ik was van plan mijn bachelor opdracht daar wilde gaan doen dan zou ik wel gaan twijfelen omdat je dan niet helemaal serieus word genomen waarschijnlijk, zo'n gevoel krijg je in ieder geval.' (respondent 13)

[For example we have now a course physical materials and the teacher of that course gave us the feeling that we were stupid. This does give me the feeling that if I wanted to do my bachelor assignment in that subject I would doubt if I want do that because you do not feel that your are taken seriously, that is the feeling you get at least.]

This respondent continues with saying that she thinks that it would be different when she was a male student:
'We hadden wel het gevoel dat als we jongens waren die achter in de zaal zaten dan was het niet gebeurd.' (respondent 13)

[We had the feeling that if we were boys who were sitting at the back during classes this would not have happened.]

7. Responses of the environment to respondents the same but feelings about it different

All the respondents had corresponding experiences when they were asked how people responded to them studying in a STEM field. In line with the theoretical framework the respondents experienced stereotypical thinking in which female students did not fit the description of someone with a STEM study. For example the quotation below shows one of those responses. Besides that, the respondent confesses that she also has this stereotypical thinking when it comes to what kind of studies female students participate in.
'Er zijn wel mensen die letterlijk zeggen van 'ow dat had ik niet verwacht' en meestal zeg ik dan gewoon 'het is wel zo, maar dank je wel'. Het is niet iets vervelends en ik snap het ook wel want als ik moet gokken van een meisje wat voor studie die doet dan zou ik ook denken technische geneeskunde of zo iets.' (respondent 9)

[Some people literally say 'oh I did not expect that at all' and most of the time I respond with 'but it is true, but thanks'. It is not something that bothers me and I get it because if I had to guess what a girl is studying than I would also think something like technical medicine.]

The respondents have different feelings about the responses of their environment. In the next quotation the respondent answers to the question if the reactions of the environment influences her.
'Nee ik vind het eigenlijk wel grappig dat mensen denken dat ik super slim ben. Maar verder niet.' (respondent 18)

[No, I actually find it funny that people think I am really smart. But nothing else.]

Other respondents mentioned that being seen as smart is just an interpretation and she discusses that every person performances better at different aspects of life.
'De reactie die het meeste er was 'he echt, studeer je dat. Dat is vet ingewikkeld'. Ik heb altijd zo iets van ja het is een ingewikkelde studie maar als ik Frans ga studeren zou dat voor mij heel ingewikkeld zijn. Dit is gewoon iets wat mij goed ligt en andere dingen die voor jou heel makkelijk zijn dat zou mij niet liggen.' (respondent 19)

[The most common reaction is 'really, you study that? That is really complicated'. I always think yes it is a difficult study but if I study French that would be much more complicated for me. This is just something that I am good at and other things that are easy for you are hard for me.]

On the other hand some respondents did not receive positive reactions. Their environment responded with how hard it must be or how strange it was that they did a technical study. This respondent has the following feeling about it:

'Ja ik ben er aan gewend uiteindelijk. Maar ik vind het wel jammer dat er nog zoveel verbazing is dat vrouwen technische studies doen dat stimuleert natuurlijk ook niet om meer te doen.' (respondent 11)

[Yes I got used to eventually. However I do find it a pity that still so much amazement about women with a technical study is present and that does not stimulate it of course.]

8. Importance of endorsing communal characteristics depends on the respondent

Some respondents mentioned that they wanted to be active for the society or the environment. Their personal preferences fit the description of communal characteristics. In line with the research of Diekman et al. (2011) these respondents were more willing to pursue a career in STEM when these characteristics were present in their future occupation.

'Ik heb het idee dat als scheikundig technoloog gemiddeld genomen veel meer kan doen voor het behoud van deze aardkloot en dat zou ik dan ook graag willen gebruiken. Het is natuurlijk de laatste tijd een hot topic duurzaamheid en dan ben je aan het nadenken dat we eigenlijk een groot aandeel kunnen spelen in het vergroenen van de wereld en dat zou ik dan graag willen doen. als het kan waarom niet.' (respondent 5)

[I have the idea that as a chemical engineer you can do much more for the preservation of the earth and if so I would like to do that. Lately sustainability has been a hot topic and then I think about that we can play a big part in making the earth more green and I would like that. If it is possible why not.]

9. Being in a relationship can have an influence on the respondents

Some of the respondents mentioned aspects that would be of importance in their future occupation. For example that they want to work part-time when they have children. It was noticed that these thoughts about future work-life balance were more present for graduate students in a relationship, for example the relationship influences where the couple will live and work. However, the work fields of their spouses did not influence the respondents in wanting to pursue a career in STEM or not, which Glass et al. (2013) proposed as possible factor. Per respondent it was different who in the relationship determined the location. For example in the quotation below the study and occupation opportunities of the spouse determines where they will live.

'Ja en dan waarschijnlijk rond Groningen maar het ligt er een beetje aan of mijn vriend ergens een baan krijgt waar precies weten we nog niet. Voor hem is het lastiger om werk te vinden omdat hij sociologie heeft gestudeerd en daarin zijn niet heel veel banen.' (respondent 16)

[Yes and probably somewhere in Groningen but it depends a little bit on where my boyfriend gets a job so we do not know exactly where we will live. For him is it more difficult to find a job because he studied sociology and there are not a lot of job opportunities in that field.]

On the other hand with some respondents their occupation determined where the couple will work and life.

'Omdat ik toevallig de eerste klaar was met mijn studie en een PhD ga doen zal het invloed hebben op waar mijn vriend gaat zoeken, bij voorkeur blijf ik in Enschede wonen en ga ik op de fiets naar het werk. dus gaat hij ook hier in de omgeving zoeken. Stel dat het echt moeilijk is en dat hij iets in Amersfoort of Utrecht iets vind dan moet je in het midden gaan wonen.' (respondent 19)

[Because I finished my study sooner and will start a PhD it will that influence where my boyfriend will search for a job. I prefer to stay in Enschede and go to my work by bike. So he will search in this neighbourhood. If that is really hard and he eventually finds something in Amersfoort or Utrecht we have to live in somewhere in the middle.]

10. Work and private life should be separate

Most respondents mentioned they find it important to have the weekends free for friends and family. For example one respondent mentioned that she is currently not working full-time.

'Ik werk nu ook niet helemaal fulltime, ik heb eens in de twee weken een dag vrij.' (respondent 19)

[I am not working fulltime right now; I have once in the two weeks a day off.]

The respondent was asked why this was important for her. She answered:

'Omdat het lekker vind om ook tijd voor mij zelf te hebben. De weekenden lopen heel snel vol met familie bezoeken, mijn ouders wonen in Eindhoven, de vader van mijn vriend in Noord Holland en zijn moeder woont in Duitsland en als je elke maand een keer langs wil gaan dan ben je 3 weekenden in de maand kwijt. En daarbij al je vrienden, iedereen werkt tegenwoordig en heeft alleen in het weekend tijd en dan heb ik het idee dat ik alleen maar door en door en door ga en dat kan ik niet en wil ik niet. En daarom wil ik wel wat vrij.' (respondent 19)

[Because I like it to have time for myself. The weekends are filled with family visits; my parents live in Eindhoven and the father of my boyfriend in North Holland and his mother in Germany. If you want to visit them every month than 3 weekends are already filled. And than you have friends and everybody is working now and only has time in weekends and than I have the feeling that I go on and on and on and I do not want that. En that is why I want some free time.]

11. Diversity of the study and workplace

Being a minority at the university

The respondents were asked how they experience being a woman at a technical university. The responses to this question were different. Some respondents started talking about being in de public eye because of the underrepresentation of women at the university.

'Hier als je vrouw bent sta je meteen op een voetstuk, je hebt gelijk de aandacht.' (respondent 11)

[As a women you are immediately put on a pedestal and you have the attention right away.]

How the respondents feel about this position depends on their personalities. For example the respondent of the quotation above followed with sharing an experience about being in the public eye:

'Sommige kijken van ow wow andere kijken van wat doet die dan hier dat is gewoon niet prettig dus als ik dan hakken aan had probeerde ik gewoon heel zachtjes te lopen zodat minder mensen me hoorde en niet keken want dat vind ik vervelend.' (respondent 11)

[Some people look at you like wow and others look at you like what are you doing here and that is just not confortable. So if I wear heals I try to walk really quiet so people do not hear me and do not look at me because I do not like that.]

The following respondent mentions what it means for her to be in the public eye:

'Dat heeft verschillende kanten aan de ene kant kent iedereen je en dat is goed want iedereen kent je maar dat is af en toe ook niet goed want je bent continue in de picture dus dat betekend als je ergens iets fout doet iedereen het ziet en erover praat. Terwijl als je een van de vele mannen bent dan kom je daar makkelijker mee weg.' (respondent 12)

[It has different sides to it because on the one hand everybody knows you and that is good but once in a while it is also not good because you are constantly in the picture and that means that when you make a mistake everybody sees it and talks about it. While if you are one of the many men you sooner get away with it.]

The same respondent also mentioned that being it the spotlight has it benefits.

'Het heeft voordelen want iedereen is ook meer bereid om je te helpen want ze kennen je al dus dat gaat heel makkelijk. Dus het heeft voor en na delen.' (respondent 12)

[It also has benefits because everybody is more willing to help you because they know you already and that makes it easier. So it as advantages and disadvantages.]

The following respondent mentioned the same experience with being in the public eye:
'We hebben nu 5 meisjes op ongeveer 60 mensen en je word op een beetje behandeld als een godinnetje of zo. Het is super mooi, als je bijvoorbeeld ergens hulp bij nodig hebt dan helpen de jongens meteen. Ik krijg altijd wel aandacht en dat is best wel leuk.' (respondent 13)

[We now have 5 girls of the total 60 people in class and we are getting a little bit treated as goddesses. It is really nice if you for instance need help with something the boys will help right away. I do get a lot of attention and that is quite nice.]

Another respondent mentioned how being a woman in the technical sector influenced her position during the selection for a scholarship.
'Ik heb uiteindelijk voor mijn master een scholarship gekregen en ik heb absoluut niet het idee dat ik onderdoe aan de mannen die hetzelfde scholarship hebben gekregen maar ik had wel het idee dat de reden dat ik voor de sollicitatie dag werd uitgenodigd na mijn motivatiebrief was omdat ik een vrouw was.' (respondent 19)

[I eventually got a scholarship for my master thesis and I absolutely do not have the idea I am inferior to the men who got the same scholarship but I do have the idea I that the reason I got invited for the application days was because I am a women.]

When asked the same question of how it is to be a woman at technical university some female students responded that being a minority took some time getting used to in the beginning. Some respondents even doubted to start a technical study because of the number of men.
'In het begin is het heel erg wennen en ik heb echt wel drie keer nagedacht voordat ik deze studie ging doen.' (respondent 3)

[In the beginning it took some getting used to and I really thought about it three times before I applied for this study.]

'In het begin was ik daar heel erg mee bezig en twijfelde ik of ik het wel wilde studeren want in mijn jaar zitten maar drie vrouwen toen ik begon en in de master is het wat meer want er komen wat meiden van andere studies instromen. Maar in het begin vond ik wel lastig omdat ik heel erg het gevoel had dat er naar mij gekeken werd en dat vond ik wel lastig. En het duurde wel even voordat ik mijn draai daarin had gevonden. Maar nu vind ik het eigenlijk alleen maar fijn en maak ik er gebruik van.' (respondent 16)

[In the beginning I was really busy with it and doubtful if I wanted to study this because my year had only 3 three women. During the master there were a little bit more women because there were women who came from other studies. However in the beginning I found it difficult because I really had to feeling people were looking at me. It took some time before I found my way but now I really like it and I make use of it.]

Another aspect a lot of the respondents mentioned was that they missed female contact in the beginning of their study and therefore joined committees or sport clubs to have more social contact with other female students. For example the following respondent says:
'Maar na 5 jaar ben je er wel redelijk aan gewend maar zeker in het begin toen ik hier net zat had ik nog niet zoveel aansluiting met de meisjes uit mijn jaar-laag. Toen miste ik wel vriendinnen, ik had wel vrienden maar niet echt vriendinnen. En af en toe wil je wel gewoon zeiken over je het ongesteld zijn en gewoon even je vrouwen issues kunnen delen. Dus toen ben ik in mijn tweede jaar gaan roeien en had ik een heel leuk roeiploegje en ik mijn derde jaar kwam ik in een dispuut, het is dan wel gemend, maar er zitten ook veel vrouwen bij en ondertussen ook met vrouwen uit mijn jaar-laag kan ik beter opschieten en een deel zijn mijn vriendinnen gewoon. Dus inmiddels heb ik wel gewoon vriendinnen.' (respondent 5)

[After 5 years I got quite used to it but in the beginning that was not the case because I did not have a link with the girls from my year. At that point I missed having girlfriends, I had friends but not really girlfriends. And once in a while you just want to whinge about being on your period or sharing women's issues. So in my second year of my study I joined the rowing club and I got a really fun team and during my third year I joined a mixed student club. In that student club a lot of women were present and in the mean time I also got a better relationship with the girls from my study. So those are now my friends as well.]

Future occupation

The respondents mention that the diversity of the workplace can be an influential factor. It was noticed that most respondents preferred working with men. They mention that working with mostly male students has certain type of benefits compared to working with female students. As the following respondent states:

'Ik ben zo iemand die het niet heel erg vind als er niet heel veel vrouwen zijn, minder gedoe. Ik weet het eigenlijk niet zo goed. Ik zit op stage nu met 2 vrouwen in de projectgroep en voor de rest allemaal mannen. Ik merk wel dat ik het fijn vind dat er ook nog een andere vrouw is want dan kun je toch net anders mee praten. Maar verder qua werk of zo heb ik er nog niet echt iets van gemerkt. Ik denk dat ik later ook niet perse in een vrouwen bedrijf hoef te werken.' (respondent 18)

[I do not mind not having a lot of women around, it means less hassle. I am not sure because at my internship I work in a team with 2 women and the rest are all men. I noticed that I really like that another woman is present that I can talk to. But with work itself I did not notice it. I think I do not necessarily have to work in an all female company.]

When asked why the respondent does not necessarily has to work in a all female company her answer was:

'Vanwege de samenwerking, gedoe, en werkt gewoon anders. Mannen zijn meestal wat praktischer, dus helpt wel denk ik.' (respondent 18)

[Because of the teamwork, the hassle, it just works differently. Men are most of the time more practical and that helps I think.]

Some respondents mentioned they do not want to work in an environment with only men. The following quotation is from a student who currently has an internship at a company with 99% men. Her experiences at that company influence her future decisions:

'Maar ik denk dat in het bedrijf waar ik later wil gaan werken zoek ik iets met meer vrouwen en een meer collegiale sfeer naar vrouwen toe. Het is ook echt niet leuk als je er gewoon bij zit en denkt van ik doe wel mijn werk maar echt collegiaal ben je niet met elkaar en dat is jammer.' (respondent 3)

[I think that the company I want to work in the future needs to have more women and a more amicable atmosphere for women. It is not fun when you are doing your job but are not kind to one and other. That will be a pity.]

On the other hand some respondents do not mind working in an all men's environment. The following respondent already has experiences in an all men's work field and this did not influence her future decision.

'Nee ik zou het wel gewoon proberen denk ik en als het niet bevalt dan zie ik het wel. En ook daar kon ik wel goed opschieten met die mannen in het team maar als je buiten het team met mensen die je niet kende omging dan waren die altijd wat terughoudender en misschien was dat wel politie eigen. Maar als je binnen een team werkt maakt het niet uit welk geslacht het is als het gewoon klikt dat is het belangrijkste.' (respondent 15)

[No I think I would try it and if I do not like it will do something about it. At my internship I had a good relationship with the male colleagues in my team. However if you interacted with people outside the team they were a little bit more reluctant but it can be something that is normal for the police. If you work in a team it does not matter which gender you are the most important thing is mutual respect and understanding.]

12. Upbringing of influence on thoughts about work-life balance

When looking at how the respondents want to divide their work-life balance some respondents look at their own upbringing in what they want and do not want. The set example by their parents influences their perceptions about what is normal.

'Ik vond het als kind wel gewoon prettig dat mijn moeder veel thuis was en dat je altijd iemand in huis hebt en alles weet waar alles ligt bij wijze van spreke. Ik vond het toch wel prettig en ik kan natuurlijk niet spreken voor hoe het zou zijn geweest als mijn moeder voltijd aan het werk was.'(respondent 15)

[I really liked it as a child that my mother was home a lot and that there was always somebody at home who knew everything. I just like it and I do not know how it was if my mother work full-time.]

'Ja mijn moeder heeft ook altijd gewerkt bijvoorbeeld. En dan 4 of 5 dagen in de week en ik ben niet anders gewend. Ik vind dat dus ook veel normaler en als ik dan kijk naar mijn vriendinnen die houden moeders die thuis waren en dat vond ik toen al vreemd... Dit komt ook omdat ik wist van mijn moeder dat ze het werk ook heel leuk vindt en leuker dan thuis zitten en huishouden doen. En misschien ligt dit dus ook bij mijn opvoeding dat ik heb gezien dat het anders kan. Het was ook prima en ik heb nooit ervaren dat daardoor ons gezin onder druk kwam te staan of dat ik aandacht dat te kort had. Dat heb ik nooit ervaren terwijl mijn beide ouders werkten en vaak ook voltijd. Dus ik denk dat dat wel invloed heeft.' (Respondent 2)

[Yes my mother always worked for instance. She did that 4 or 5 days a week and I am used to it. For me is far more normal if I compare it to my friends of which their mothers were home all the time. I really found that strange and I still do ... This is also because I knew my mother really liked working than being at home and cleaning the house. Maybe this is influenced by my upbringing. It was fine and I never experienced that our family was under pressure or that I did not get enough attention because my mother was not at home. I think that it has an influence.]

13. The self-concept of the respondents

Most respondents realized they were interest in STEM subjects when they entered high school and had subjects as mathematics, physics and chemistry. They experienced that they had the knowledge, skills and abilities to perform well in these subjects.

'Op de middelbare school ben ik altijd goed geweest in wiskunde en natuurkunde ook wel en ik vond biologie eigenlijk wel leuk.'… 'en toen dacht ik dit is echt leuk en het zijn de 3 vakken waar ik goed in ben. Dus toen wist ik eigenlijk al wat ik wilde doen.' (respondent 10)

[During high school was I always good in mathematics and physics and I also prefer biology… and at time I thought this is really fun and these are 3 subjects I am good at. Thus then I knew already what I wanted to do.]

Some respondents knew from an early age that they wanted to pursue a study that included engineering or science.

'Ik denk al wel op de basisschool. Toen had al flinke periodes dat ik liever met lego bouwde dan speelde en af en toe knutselprojectjes dat je dacht dat ik het leuk vond. Ik wist dan niet perse dat ik dit wilde gaan doen maar wel iets in een technische richting wel leuker vond. ' (Respondent 9)

[I think during primary school already. In that time I really prefered building things with Lego and so now and than handcrafting projects that you really prefered. I did not exactly knew what I wanted to do but something in the technical sector had my preference.]

When asked if the respondents remember their choice for a STEM study most respondents mention that this was during high school when they had to choose a profile of subjects. This profile specified certain subjects the students want to pursue and graduate in. At that time the respondents were 14 or 15 years old.

'Ik denk eigenlijk in de derde klas, want toen moest je ook kiezen welke vakken je moest doen en toen had ik eigenlijk al wel zoiets van dat ik technische vakken wilde doen.' (respondent 7)

[I actually think in the third grade, because at that moment you had to choose which subjects you wanted to do and back then I already knew I wanted to do the technical subjects.]

As previously observed the respondents had insecurities about pursuing a study with mostly male classmates. However, how small or great these insecurities were it did not influence them to pursue their dreams. For example one respondent mentioned that gained experiences in other work fields influenced her decisions. While for other respondents open days and student-for-a-day programmes clarified that a STEM study was the right choice. With gained experiences and personal traits of the

respondents the higher self-concept of the female students enabled them to make a successful decisions about their study and occupations.

Is STEM their future?

Many of the respondents are aware that companies want to increase the diversity and that this can be beneficial for them. The following example shows how the respondents think about their position.

'Ja ik denk het wel want ik merk wel dat bij bedrijven dat iedereen wel vrouwen wil en dat het goed is voor de groepsdynamiek en voor de balans in je bedrijf en dat snap ik ook. Maar daarom ben ik wel gewilder en dat klinkt misschien een beetje raar maar kiezen ze mij voor een andere jongen die misschien wel slimmer is of wat anders heeft gedaan.' (respondent 16)

[Yes I think so because I noticed that within companies women are wanted and that companies think it will be good for their group dynamics and the diversity and I can understand that. That is why I am more wanted and that sound maybe a bit strange but they will choose me over a boy that is maybe smarter or has done other things.]

The respondents were asked if they see themselves working in a work field they are educated in. Almost every respondent had a positive reaction to this question. Most of the respondents did not exactly know where they wanted to work in the future but in general they want some connection with their educational field. Only one respondent was certain that she does not want to pursue a career in her educational field. Her response to why she does not want to pursue it was the following:

'Wat ook een beetje mijn achterliggende gedachte is dat ik een groep vriendinnen heb en daarin zie je alles van stress tot depressie tot burn-out waarbij hier op de UT stress sowieso overal is, maar ik weet niet wat allemaal voor ziektes bij mij in de groep en dan denk ik we zijn allemaal zulke jonge meiden dat hoeft vind ik niet. En met mijn onderzoek stond ik aan de kant van het maken van medicijnen op vernieuwbare manieren en toen dacht ik dat wil ik eigenlijk helemaal niet. Ik wil juist aan die andere kant staan om te voorkomen dat we daar überhaupt belanden. En zou super zijn als ik dat aan scholen en universiteiten of wat dan ook kan leren.' (respondent 8)

[What my underlying thoughts are is that I have a group of friends and I see a lot of stress and burnouts with them. Here at the UT stress is everywhere but I do not know all the kinds of illness are present within my group of friends but then I think we are all so young and it is not necessary to be ill. With my master research I was making medicine and then I realized I did not want that anymore. I want to be preventing it and not cure it. And it would be great if I could teach schools and universities that.]

Besides the fact that the respondent was the only one who did not want to pursue a career in a STEM related subject, her motivation to be more active with her lifestyle and society is something more respondents shared as mentioned at section 8. A visual presentation of the summary of the theoretical framework and the findings can be found in table 2. The table clarifies if the factors have a perceived influence on the choices of female students and if the factors have a positive or negative influence. It was found that the factor childhood experiences were only present for a small number of students and therefore we cannot make a statement about this factor with full certainty. Besides that the perceived job satisfaction of female students was thought to be of influence based upon the theoretical framework. While this is of influence the job satisfaction depends on other factors as the diversity of the workplace and the separation of work and private life. For the respondents the postponing of marriage and having children in favour of STEM occupations and perceptions of job tenure was of no influence for pursuing a STEM study or possible occupation.

Table 2 summary theoretical framework and findings

Constructs	Dimensions of constructs	Findings perceived influence on study choice
Reinforced lack of Interest in STEM (Dweck et al., 2009; Lindemann et al., 2016)	Parental influence	Yes – positive or negative
	Teachers influence	Yes – positive or negative
	Traditional or conventional childhood experiences (Powell et al., 2012)	Maybe – positive
	New: Open days/ student-for-a-day programmes	Yes – positive
	New: Role models	Yes – positive
Stereotyping about gender cognitive differences (Moss-Racusin et al., 2012; Medera et al., 2009)	Perceptions about agentic characteristics of men (aggressive, ambitious, dominant, forceful, independent, self-sufficient, self-confident, act as a leader)	Yes – negative
	Perceptions about Communal characteristics of women (affectionate, helpful, kind, sympathetic, interpersonally sensitive, nurturing and gentle) (Eagly & Karau, 2002; Diekman et al., 2010)	Yes – negative
	New: Stereotypical jokes	Yes – negative
	New: Feeling of needing to prove one selves	Yes – negative
	New: Endorsement of communal characteristics	Yes – positive
Gender supportive workplace culture (Glass et al. 2013)	Perceptions about postponing of marriage and having children in favour of having STEM occupations	No – negative
	Perceptions about perceived job tenure	No – positive
	Perceptions about job satisfaction (Glass et al., 2013)	Yes – positive or negative
	New: Having a life partner	Yes – positive or negative
	New: Separation work and private life	Yes – positive
	New: Diversity of study and workplace	Yes – positive
	New: Set example by parents	Yes – positive or negative
New: Cognitive and personal traits of female students	New: Self concept of female students	Yes – positive or negative

5. Discussion

In this research we explore factors that can influence the choices of female graduate students to pursue a university study and possible occupation in STEM fields. The aim is to discover nuances in the details of the constructs of the theoretical framework. The first construct is the reinforced lack of interest female students can have in STEM education and work. The second is the beliefs about the cognitive differences between men and women and the competencies required to fit STEM studies and work fields. The third is the perception of female students about gender supportive workplace cultures. The fourth is the self-concept of female students. The findings nuance the details of previous research by revealing 13 factors that could be perceived as influencing female graduate students in pursuing a university study and possible occupation in STEM. What was a striking observation was the presence of prejudice and stereotypical behaviour of the environment of the female students. The female students shared their feelings, stories and experiences and this showed that some female students perceived misbehaviour of teachers, classmates, students of other studies and/or others in their environment. We did not expect that female unfriendly behaviour was still present at the university. Besides this negative influencer female students also mentioned factors that could have a positive influence on the perceptions of female students in pursuing a STEM university study. In the next sections the 13 perceived factors are discussed.

Reinforced lack of interest in STEM

Parental and teachers influence

The theory explains that social influencers as parents and teachers can influence the possible interests (or lack of it) of female students (Powell et al., 2012). Our results reveal that this corresponds with the theory. The respondents were encouraged by their parents to pursue a study they found interesting, made them happy and corresponded with their knowledge, skills and abilities. The trend analysis of VHTO by Booy et al. (2012) demonstrates that students base their study choice on two questions 'Do I want to do this' and 'Can I do this'. The results clarify that the respondents answered the question 'Do I want to do this' with the encouragement of parents and teachers. An interesting fact is that with more than half of the respondents one of the parents had a STEM background as was suggested by Powell et al. (2012). The marketing and communication marketer, with whom the results were discussed, describes this phenomenon is common at the university. She explains that students are familiar with STEM from a very young age. Therefore the barrier to choose a STEM study is much lower for them compared to female students of whom their parents have no STEM background. Besides parents can teachers also influence the choices of female students. Teachers can have an influence on making a subject interesting with their enthusiasm about the subject. Furthermore, teachers who challenge students and understand the needs of every individual student are influential. It is also essential that teachers do not judge female students based on their gender and have a growth mind-set. As previous research has revealed a growth mind-set influenced female students to pursue a career in STEM (Yeager & Dweck, 2012). Within this research it is observed that most parents and teachers of the respondents tried to achieve this. The perceptions and behaviours of parents and teachers determine if female students are influenced positively or negatively.

Open days/ students-for-a-day programmes

Another factor that initiates interest in a certain STEM study is the quality of an open day and/or student-for-a-day programme. Almost all respondents mention that experiences during these days influenced them in choosing a certain type of study. While the interest for STEM subjects started in

high school or maybe even earlier, the choice for a STEM study was among other things based on feelings, stories and experiences during these days.

Role models

Most of the respondents mention that they did not have female STEM role models influencing them growing up. An explanation can be that during their high school experience no frequent focus was present on role model strategies. Role model strategies are nowadays more popular because research has clarified that the ability to identify with women from your study or job of interest makes a study and/or possible occupation more accessible for female students (Booy et al., 2012). Special events organized by the university positively influence the perceptions of female students about their possibilities within STEM. For example during one of these events inspirational women spoke about their experiences in STEM work fields. It also has been noticed that a lot of respondents participate in being a role model for the next generation of female students. They provide high school female students with information and share experiences, stories and feelings. The respondents explain that they want to show high school female students how entertaining STEM studies can be.

Stereotyping about gender cognitive difference

Perceptions about communal and agentic characteristics

The theory notes that stereotyping about gender cognitive difference influences female students to pursue a university study and possible occupation in STEM. For example previous research revealed that the perceptions of female characteristics do not fit the competencies needed for STEM studies while the perceived characteristics of men do. The O*net database showed that the competencies needed for STEM studies and occupations are not based on gender roles and there is no clue for male students to have by definition more qualifying competencies. However, the results reveal that stereotypical thinking about who fits the description of someone with a STEM study is still present. All the respondents mention that their environment is surprised when hearing what they study. The characteristics and the appearance of the respondents do not fit the description of someone with a STEM study according to their environment. In other words the respondents are judged based on gender stereotypes. How these perceptions reflect on the female students varies. For some female students it was seen as a compliment that they were not identified as a stereotypical female STEM student and that they were perceived as brave to study in a male dominant field. For other female students these reactions had negative influences on the feeling of belonging at the university.

Need to prove possession of knowledge, skills and abilities

The respondents have shared experiences of prejudice and stereotypical thinking, for example some respondents have the feeling that they have to prove that they posses the same knowledge, skills and abilities as their male classmates. These respondents feel that they are judged based on their appearance and gender and that they only get academic appreciation after they perform well. These perceptions of the environment can have a negative influence of female students in feeling at home at the university.

Stereotypical jokes

Most respondents encounter some kind of stereotypical jokes from classmates and/or teachers. Although this made some respondents uncomfortable this has not influenced their decision to pursue a STEM study and possible occupation in the future. However, the stereotypical behaviour of the environment did influence aspects within a STEM study or possible occupation. For example the

culture at a university or company can influence where female students want to study/start their PhD and at which company they want to start their internship or work.

Endorsement of communal characteristics

Besides the stereotypical perceptions of female characteristics the endorsement of communal characteristics within STEM studies and possible occupations can also be of influence. The results of the research of Diekman et al. (2011) have revealed that female students were more willing to pursue an occupation in STEM when it includes communal characteristics. Prior research also indicated that women are more attracted to studies with aspects of health, the human body, medicine, ethics and aesthetics (Van Griethuijsen, 2015; Sjøberg & Schreiner, 2010). Within this research it is observed that some respondents want to be active within those departments during an occupation in STEM. This is in line with previous research that the endorsement of communal characteristics can have a positive influence on the perceptions of female students about STEM studies and occupations.

Gender supportive workplace culture

Diversity of study and workplace

The theory has stated that gender supportive workplace culture could influence female students in pursuing a STEM university study and possible occupation. The results explain that current lack of diversity at universities can have a positive and negative influence on the perceptions of female students. On one hand respondents know they are more appealing to accepted or hire because universities and companies want to increase the diversity. On the other hand it can also influence female students willingness to study or work in a men's culture. The respondents mention that the current underrepresentation of women at universities and companies makes women more visible. For some respondents this brings a certain type of pressure because a mistake is easily noticed. However, the respondents also mention that studying and working in a men's culture can also have it benefits for example during teamwork. Most respondents prefer working with male students and colleagues although this has a limit. Female students do want to have some interactions with other female students during classes, teamwork or meetings. As the trend analysis of VHTO by Booy et al. (2012) clarifies feeling at home at a university, a company or within a team is key with integration in the population at work or school. A successful integration can influence the performance and enjoyment of study or work. It is not necessary to have a 50-50 split but when one third of the minority is represented it can have a full influence on the culture (Kanter, 1977).

Having a life partner

It is observed that serious thoughts about work-life balance are more present for respondents with a life partner. The relationship can influence the preferred type of contract and the location of finding work but it does not influence their willingness to work in STEM fields. The results of this research are not conclusive about if having a life partner is influencing female students positive or negative.

Separation of work and private life

Another influential factor is the separation between work and private life. The respondents find it important that work and private life is separated and that they have enough quality time with friends and family. Therefore, female students do not mind working part-time to get the preferred separation of work and private life. This shows that their personal well-being and quality time with friends and family is for some respondents more important than the strive for highest professional achievements.

Set example by parents

Parents can also influence the perceptions of work-life balance. For example some respondents mention that the set example by their parents in the division of roles influenced them in how they want to divide their time between work and family in the future.

Cognitive and personal traits of female students

Self-concept of female students

Looking at the other question of the VHTO trend analysis 'Can I do this' a difference is present between male and female students. As the research of VHTO clarifies female students have a lower self-concept than male students and therefore have more the tendency to say they 'cannot do it'. The respondents mention that their environment sees STEM studies as difficult and takes hard work. The perceptions of the difficulty of a certain type of study can be influential for female students who have a lower self-concept. The respondents themselves say it is only a perception, what can be difficult for one person can be hard for the other and visa versa. This statement reveals the confidence and self-knowledge the respondents have about their knowledge, skills and abilities and can be seen as an influential factor for a successful performance within a STEM environment.

Practical recommendations

This research highlighted a number of factors that could be perceived as influential for female students to pursue a university study and possible occupation in STEM. The support of the Dutch government to increase the number of female students choosing STEM studies may have stimulated the uplift among high school female students to choose technical subjects (CBS, 2018). However, the choice for a university STEM study is not increasing at the same rate and at universities female students stay underrepresented. Therefore high schools, universities, companies and the government should focus on increasing the participation of women in subjects, study programmes and departments where female students are a minority.

The guidance of high school teachers can be an influential factor in increasing the number of female students choosing a university STEM study. Teachers should try to increase the confidence of female students. This can be accomplished by focusing on a growth mind-set and teaching female students that they 'Can do it'. An important component is creating an environment where the performance of female students is judged on their knowledge, skills and abilities. If female students are thought to have a positive self-concept the successful decisions-making process can increase. High school and university teachers should acknowledge that the presentation of teachers and subjects could be interpreted differently per gender and individual. For example the respondents had different experiences and opinions about stereotypical jokes and behaviours. Every individual has different characteristics and cannot be judged based on the perceived characteristics of a gender group. Therefore, it is recommended that high schools and universities try not to act upon these stereotypes but focus on a growth mind-set. It is also recommended that high schools and universities create an open and transparent environment where students have the feeling they can share their feelings, experiences and stories about the perceived (mis-) behaviour of teachers and/or classmates.

During open days and student-for-a-day programmes universities have the opportunity to show their willingness to increase the diversity. As previous research and the result of this research clarify female students are sensitive to the experiences and stories of women in STEM studies and work fields. As the communication and marketing marketer states the University of Twente is trying to incorporate more female students during open days and student-for-a-day programmes. It is recommended that to attract more potential female students the university has the voluntary support of

current female students. However, it is important to spread realistic information about study programmes. This means that there should be a realistic representation of the diversity of the study programme. Attracting female students based on false pretences can influence the performance, enjoyment and retention of women during their study.

It is also recommended that high schools and universities try to incorporate more communal characteristics in the curriculum of their subjects and study programmes. As prior research revealed studies that incorporate aspects as health, medicine, life science, ethics and aesthetics are more popular among female students. This provides great opportunities for STEM subjects and studies that are currently more focussing on the agentic aspects of their study programme. For example the curriculum can be described with the development of a robot arm for a car factoring company and/or for a hospital. For both examples the same calculations are needed only the interpretation of it is different. By tailoring the curriculum of a study programme it can be interesting for individuals with agentic and/or communal characteristics. The results of this research exposed that the endorsement of communal characteristics is not only important when choosing a study but also in pursuing a STEM occupation. Therefore a lot can be gained from integrating both agentic and communal characteristics in the presentation of occupations to attract a diverse group of students.

Limitations and implications for future research

Although this research has gathered great insights, some limitations can be mentioned. In this research only female graduate students were interviewed of which the negative factors as stereotyping or a low self-concept were not defining. Therefore it might be interesting to interview female high school graduate students who still need to choose a university study. Interviewing female graduate high school students may provide insights in which factors positively and negatively influence female students to pursue a certain type of study. Besides that, this research clarifies influential factors for female students of a Dutch university. For future research it might be interesting to compare these results to foreign universities. Prior research showed that the underrepresentation of female students at technical universities is more a West European phenomenon (Booy et al., 2012). Therefore researching influential factors for female students at non-Western universities may entail fruitful insights for technical universities in the Netherlands.

With this research we explored which factors could be perceived as influential for female students to pursue a university STEM study. For future research it would be interesting to research if the technical universities in the Netherlands incorporate the gained knowledge from research into the underrepresentation of women in STEM. The results of this research for example clarify that the endorsement of communal characteristics can be of relevance for female graduate students. We know that currently the University of Twente is, in some departments, reviewing their curriculum to see if more communal endorsement can be realised. For future research it might be interesting to investigate what technical universities do to increase the diversity.

6. Conclusion

We believe that this research nuanced the details of the constructs and revealed factors that influence the choices of female graduate students to pursue a university study and possible occupation in STEM. With this research we have tried to contribute to the understanding of the underrepresentation of women in STEM. We have found perceived influential factors within the constructs of the reinforced lack of interest of female students, stereotyping about gender cognitive differences, gender supportive workplace culture and the cognitive and personal traits of female students. Therefore we can conclude that parents, teachers, events organised by the university and role models can have a positive influence

the perceived interest of female students. The stereotyping about cognitive difference can have a negative influence on female students to pursue a STEM study and possible occupation. The perceptions about agentic and communal characteristics and the fit of these characteristics with STEM studies, the stereotypical jokes/behaviours and disbeliefs about possessing the knowledge, skills and abilities are factors that are still perceived within the environments of the female students. These factors influenced the respondents in feeling if they belonged in STEM studies. On the other hand the endorsement of communal characteristics can positively influence female students to pursue a university study and possible occupation in STEM. Having a life partner and the set example by parents influences perceptions about the future but the effects of these factors were not perceived as influencing the pursued of STEM studies and occupations. The separation of work and private life and the diversity of study or workplace can have a positive influence on perceptions about gender supportive workplace culture. Furthermore, the self-concept of female students can influence the choices of female students about their university study and possible occupation. To increase the level of successful decision-making, female students should be thought they 'can do it' and to have a growth mind-set about their own knowledge, skills and abilities. We do have to make a footnote that for every female student the degree of influence differs per factor. This means that a differentiation between female students viewpoints has to be considered. However, the 13 factors that are found in this research provide a nuance in the research into understanding the underrepresentation of female students in STEM studies and fields.

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Appendix A distribution male and female master students UT

Study	% Men 2013	% Women 2013	% Women 2014	%Women 2014	% Men 2015	% Women 2015	% Men 2016	% Women 2016	% Men 2017	% Women 2017
M Nanotechnology	80,77%	19,23%	76,92%	23,08%	71,43%	28,57%	85,71%	14,29%	87,76%	12,24%
M Internet Science and Technology	93,75%	6,25%	88,89%	11,11%	100,00%	0,00%	100,00%	0,00%	80,00%	20,00%
M Computer Science	92,42%	7,58%	95,31%	4,69%	90,44%	9,56%	84,56%	15,44%	85,14%	14,86%
M Embedded Systems	100,00%	0,00%	97,78%	2,22%	95,08%	4,92%	91,67%	8,33%	94,74%	5,26%
M Applied Mathematics	65,52%	34,48%	75,41%	24,59%	71,64%	28,36%	68,06%	31,94%	70,77%	29,23%
M Electrical Engineering	89,33%	10,67%	93,33%	6,67%	91,21%	8,79%	93,00%	7,00%	92,70%	7,30%
M Applied Physics	89,89%	10,11%	88,76%	11,24%	84,91%	15,09%	83,96%	16,04%	82,61%	17,39%
M Chemical Engineering	71,43%	28,57%	69,52%	30,48%	70,59%	29,41%	72,86%	27,14%	75,95%	24,05%
M Mechanical Engineering	91,48%	8,52%	91,87%	8,13%	90,30%	9,70%	88,89%	11,11%	88,44%	11,56%

Appendix B Sample characteristics

Background information	#1	#2	#3	#4	#5	#6	#7	#8	#9
Age		32	22	25	22	27	23	25	22
Study	Computer science	Chemic	Chemical Engineering	Nanotechnology	Chemical Engineering	Chemical Engineering / Nanotechnology	Computer science	Chemical Engineering	Werkbouwtuigkunde
Current level of education	Master	Master	Master	Master	Master	Master	Master	Master	Bachelor
Nationality	Romanian	Dutch	Dutch	Brazilian	Dutch	Italian	Dutch	Dutch	Dutch
Experience in work field	No	Yes	Yes	No	No	Yes	Yes	Yes	No
Relationship		Yes	Yes	Yes	No	Yes	No	No	No

#10	#11	#12	#13	#14	#15	#16	#17	#18	#19
24	24	38	21	21	23	24	26	23	26
Mechanical Engineering	Applied Physics/ Applied Mathematics	Applied Physics	Technische Natuurkunde	Applied Physics	Nanotechnology	Mechanical Engineering	Mechanical Engineering	Applied Physics	Applied Physics
Master	Master	Assistant professor	Bachelor	Master	Master	Master	Master	Master	PhD Applied Physics
Dutch	Dutch	Dutch	Dutch	Dutch	Dutch	Dutch	Dutch	Dutch	Dutch
Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes
No	No	Yes	No	No	Yes	Yes	Yes	No	Yes

Appendix C Interview protocol

Introduction interview
Introduction: Thank you again for participating and your willingness to share story with me. My name is Merel Smink, 24, and a BA master student at UT. I chose the track HRM because I am very interested in human interaction and philosophies, policies and practices companies and people can use influence the behaviour of employees, colleagues, students, and people.

Goal: I would prefer to understand the experiences; feelings and meanings female graduate students of the UT have about their academic Science Technology Engineering Mathematics studies. With this understanding I prefer to gather insights in factors that influence female graduate students to pursue a career in the field they are educated within STEM studies and work fields. It is very important that you talk about your own individual perceptions and experiences. There is no "objective truth" here, but only experiences, perceptions and stories.

Anonymous: Do you mind if the interview is recorded? The interview is confidential and the records will only be used for the purpose of this study. No names will be mentioned in the finale report.

Time: this interview will last between 30 minutes and an hour.

Before we start the interview do you have any questions? If you have any questions during the interview or something is unclear please do not hesitate to ask me.

Background information respondent
Could you introduce yourself?

- Why did you choose this study and this university?
- How do you describe your study?
- Do you find your study difficult? And – why?
- And how would you compare your study results with classmates?

Research question
Warming up:
Could you please, describe for me, what does it mean to be a "girl" in a technical university study? (Examples, emotions, feelings)

The literature indicates that social influencers reinforce the interest in STEM subjects or lack of it, for ex., parents, teachers and/or childhood experiences

1) Can you tell something whether you experienced the influence of **social environment** in your choice towards this study and your interest in STEM?

- Was there a particular "moment" when you knew, that you would go for this study? Could you describe that? What did you "dream" of in this choice?

2) The literature also indicates that **stereotyping** about female students in STEM studies influences the fit with STEM studies and work fields. What is your opinion about this statement? Have you

experienced being judged under such a stereotypical thinking? Could you elaborate on it? When, how, what? How did you feel when you noticed that?

3) Do you think that **others at your study** (teachers, classmates) view you or interact with you differently because you are the female student? Could you elaborate on it? When, how, what? How did you feel when you noticed that? Examples?

4) Is there a difference between male and female students in the way **teachers** interact with students during your study?

- Is there a mutual feeling about this among students?
    - If yes: why?
    - If not: Why not?
- Could you elaborate on it? When, how, what? How did you feel when you noticed that? Examples?

5) Do you see that male and female students at UT are treated differently? How do you see it? Was it different at school? Why? Examples?

6) The literature also states that **gender supportive work-life balance** (partner, marriage, children, and long hours) can influence the career decisions of women. Do you feel that this already applies for you and if so why?

7) What are your plans after graduation?

8) Can you tell me something about your perception of an ideal work-life balance?

- Why are these aspects important for you?

9) Do you think that a (potential) relationship or motherhood will influence your career decisions?

- If yes: why does a partner or motherhood influence your career decisions?
- If not: why not?

Ending

Before we end this interview is there anything that you have not shared yet but really want to? Are there factors that are not discussed but do influence you decision about your future?
I do have one last question, do you have any contact information of fellow students who I could contact to interview as well.

Thank you very much for you time and energy in providing me with this information. As stated before the results are confidential and completely anonymous.