Master's thesis

NTNU
Norwegian University of Science and Technology
Faculty of Information Technology and Electrical Engineering
Department of Computer Science

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Establishing Effective Mentoring Programs for Gender Diversity in Computing Academia

Master's thesis in Computer Science
Supervisor: Letizia Jaccheri
Co-supervisor: Anna Szlavi
June 2024

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ABSTRACT

Context: Gender diversity is essential for the future of technology development. Despite gender equality being a goal in all areas of society, women are underrepresented in the computing field and face challenges that lead to drop-out. Therefore, strategies to retain women, such as mentoring, are crucial to achieve gender diversity.

Objective: Due to the lack of research on the retention and prevention of drop-outs among women in computing academia, this Master's Thesis aims to create guidelines on how to establish mentoring programs for women in this field. The guidelines are presented in a video series aiming to support the decision-making process of such mentoring programs.

Method: A systematic literature review was conducted in preparation for the Master's Thesis, revealing a gap in the research on mentoring programs for women in academia. Twelve semi-structured interviews of women involved in two mentoring programs at the Norwegian University of Science and Technology, Ada_veileder and IDUN, were conducted. This was followed by a design and creation phase involving two iterations of creating a series consisting of seven learning videos. Three focus groups evaluated the video series. The study aims to answer two research questions: *"What factors should be taken into account when designing a mentoring program for women in computing academia?"* and *"What considerations and qualities should mentors have when mentoring women in computing academia?"*.

Results: Seven categories emerged from the interviews: expectations, matching, duration, relationship type, delivery method, mentor qualities, and mentor's benefits. The thesis explains what to consider for each of these categories when establishing a mentoring program and when mentoring females in computing academia.

Conclusion: The thesis concludes that it is essential to choose the appropriate structure and mentors when establishing a mentoring program. There must also be a balance between achieving the program's primary goal and gaining additional benefits. Based on findings from interviews with participants from IDUN and Ada_veileder, universities should focus on and budget for developing permanent, iterative mentoring programs, instead of relying on grants for temporary efforts.

Keywords: *Gender diversity, equality, mentoring, mentoring programs, computing, learning videos*

SAMMENDRAG

Kontekst: Likestilling blant kjønn er essensielt for fremtidens teknologiske utvikling. Selv om likestilling blant kjønn er et mål i alle samfunnsområder, er kvinner underrepresentert i teknologibransjen og møter utfordringer som fører til at de forlater feltet. Derfor er strategier for å beholde kvinner, som mentorprogrammer, avgjørende for å oppnå likestilling.

Formål: På grunn av mangelen på forskning rundt å beholde og forebygge frafall av kvinner innenfor informasjonsteknologi akademia, har denne masteroppgaven som mål om å lage retningslinjer for hvordan man kan etablere mentorprogrammer for kvinner i dette feltet. Retningslinjene presenteres i en videoserie som har som mål om å veilede i valgene som må tas i etableringen av et slikt mentorprogram.

Metode: Et systematisk litteratursøk ble gjennomført som forberedelse for masteroppgaven. Litteratursøket avslørte en mangel på forskning om mentorprogrammer for kvinner i informasjonsteknologi akademia. Tolv semistrukturerte intervjuer av kvinner som har vært involvert i to mentorprogrammer på Norges teknisk-naturvitenskapelige universitet, Ada_veileder og IDUN, ble gjennomført. Deretter ble det utført to iterasjoner i utviklingen av en videoserie bestående av syv læringsvideoer. Videoserien ble evaluert av tre fokusgrupper. Studiet ønsker å besvare to forskningsspørsmål: *"Hvilke faktorer burde tas i betraktning når man utformer et mentorprogram for kvinner i informasjonsteknologi akademia?"* og *"Hvilke hensyn og kvaliteter burde mentorer ha når de veileder kvinner i informasjonsteknologi akademia?"*.

Resultater: Dataen fra intervjuene ble delt inn i syv kategorier: forventninger, matching, varighet, relasjonstype, remote vs. fysisk, mentoregenskaper og mentorfordeler. Masteroppgaven forklarer hva man burde ta i betraktning for hver av de syv kategoriene når man skal etablere et mentorprogram og være en mentor for kvinner i informasjonsteknologi akademia.

Konklusjon: Masteroppgaven konkluderer med at det er essensielt å velge passende struktur og mentorer når man etablerer et mentorprogram. Det må også være en balanse mellom å nå programmets hovedmål og å oppnå andre fordeler. Basert på intervjuer av kvinner som har vært involvert i IDUN og Ada_veileder, konkluderer oppgaven med at universiteter burde fokusere på og budsjettere for utviklingen av permanente og iterative mentorprogrammer, i stedet for stipender for midlertidige

tiltak.

Nøkkelord: Likestilling, kjønn, mangfold, mentorprogrammer, informasjonsteknologi, læringsvideoer

PREFACE

The Master's Thesis is written for the course TDT4900 - Computer Science, Master's Thesis as part of the Computer Science Master's Degree Programme at the Norwegian University of Science and Technology in Trondheim. The research is supervised by Professor Letizia Jaccheri with Postdoctoral Researcher Anna Szlavi as co-supervisor.

The thesis is based on the author's specialization project titled: "Understanding Mentoring Programs for Increased Gender Diversity in Computing: A Systematic Literature Review", from the course TDT4501 - Computer Science, Specialization Project [1]. Parts of this Master's Thesis are therefore taken from or based on the specialization project. Chapter 2 in the thesis is based on and uses several of the same theories and references as Chapter 2 in the specialization project. Chapter 3 in the thesis is a summary of and entirely based on the specialization project. The chapter is mostly rewritten. However, some figures and tables are taken from the specialization project.

ChatGPT 3.5 is used to rephrase and translate the author's own content, as well as find synonyms. Grammarly is used to assist with grammar and writing errors.

The video series of the seven learning videos can be accessed through this link:

`https://www.youtube.com/playlist?list=PLdG4pR4ty7wAVMnWcH36G2r7x8DifnpmF`

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Finally, I want to express my gratitude to the mentors, mentees, and organizers from the two mentoring programs, Ada_veileder and IDUN, who participated in interviews for the thesis, as well as the people participating in the focus groups. You provided valuable insights, experiences, and feedback to the research.

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ABBREVIATIONS

List of all abbreviations in alphabetic order:

- **ACM** Association for Computing Machinery
- **AI** Artificial Intelligence
- **DEI** Diversity, Equity, and Inclusion
- **EU** European Union
- **ICT** Information and Communications Technology
- **IE** Faculty of Information Technology and Electrical Engineering
- **IT** Information Technology
- **NTNU** Norwegian University of Science and Technology
- **PhD** Doctor of Philosophy
- **RQ** Research Question
- **SDG** Sustainable Development Goal
- **SIGSOFT** Special Interest Group on Software Engineering
- **SLR** Systematic Literature Review
- **STEM** Science, Technology, Engineering, and Mathematics
- **UN** United Nations
- **WCI** Women and Computing Initiative
- **WP3** Work Package 3

CHAPTER

ONE

INTRODUCTION

1.1 Motivation

Teamwork is a crucial part of successful software projects and due to increasing globalization, diversity in the field has become essential [2]. Research proves that diverse teams in software development are more qualified to understand the needs of the user, as well as leading to innovation and a healthier work environment [3]. Gender diversity is also an important factor for attracting and retaining women to companies [2]. Previously, women were assigned jobs with lower responsibilities than their male peers because it was believed that women were less capable than men and that their primary responsibility was taking care of their families [2]. Despite there being laws aiming to promote gender equality and avoid discrimination in all areas of society [4] and the United Nations (UN) 5th Sustainable Development Goal (SDG) [1] seeking to "achieve gender equality and empower all women and girls" [5] by 2023, women are underrepresented in the computing field. They continue facing various challenges such as the glass ceiling, lack of peer parity, and impostor syndrome [3]. The challenges contribute to female students feeling a lower sense of belonging in the field than their male peers [6], a feeling strongly associated with students' academic motivation [7] which is crucial to ensure retention [8].

In Norway, women make up 29% of the technology industry and 24% of studies within science, technology, engineering, and mathematics (STEM) [9]. Extra credit for female applicants has long been used to attract girls and women to pursue a career in computing. However, attracting more women to the field will not, by itself, reduce the gender gap; efforts must also be made to retain them [3] and to prevent drop-out. According to Patón-Romero et al. [10], more women leave the information technology (IT) field than men, and half of the women in the field leave their technical position before turning 35. Therefore, organizations must

[1] https://www.un.org/sustainabledevelopment/sustainable-development-goals/

implement strategies to retain women in computing education and industry such as employing more women in leadership positions, recognizing their work, and arranging events and groups to foster more interaction among women [3]. One way to foster such interaction in the field is by establishing mentoring programs. According to Kram, mentoring is "a relationship between an older, more experienced mentor and a younger, less experienced protégé for the purpose of helping and developing the protégés career" [11]. Mentoring is an effective tool to encourage women's careers, both in the early stages of education [12] and later in academia [13], by increasing skills [14], and confidence [13], as well as creating a platform for support [14].

1.2 Project Description

This Master's Thesis is written as a part of the Women STEM UP project [2] and its goals regarding the creation of guidelines for establishing mentoring programs, as well as training on how to mentor female students [15]. The thesis presents seven factors that should be considered when designing a mentoring program for females in computing academia: expectations, matching, duration, relationship type, delivery method, mentor qualities, and mentor's benefits. Reflections are made on what to avoid and what to include in such programs. This information is used to create a video series consisting of seven learning videos, each dedicated to one of the mentioned topics. The data used in the thesis is gathered from semi-structured interviews of mentors, mentees, and organizers of two mentoring programs for women at Norway's largest university [16], the Norwegian University of Science and Technology (NTNU) [3]: IDUN [4] and Ada_veileder. In addition, a systematic literature review (SLR) [1] was conducted as a preparatory study for the Master's Thesis. Lastly, focus groups involving interview respondents and other students from the university are used to evaluate the learning videos.

1.3 Research Objective

The SLR conducted in preparation for the Master's Thesis revealed a gap in the research on mentoring programs for women in the computing academia and industry [1]. Most mentoring programs for women in computing are directed toward K-12 students and focus on attracting girls to the field. However, few programs are dedicated to retaining and avoiding drop-outs among the women who have started their computing education or career. Therefore, the objective of this Master's Thesis is to create guidelines on how to establish a mentoring program for women in computing academia to motivate and inspire more women to continue pursuing their degrees or careers in the field.

[2] https://women-stem-up.eu/
[3] https://www.ntnu.edu/
[4] https://www.ntnu.edu/idun

Two research questions (RQs) are defined to investigate the phenomenon of interest:

- **RQ1: What factors should be taken into account when designing a mentoring program for women in computing academia?**
- **RQ2: What considerations and qualities should mentors have when mentoring women in computing academia?**

1.4 Thesis Outline

The background theory for the Master's Thesis is provided in chapter 2, and a summary of the SLR is presented in chapter 3. Further, the methods used to collect and analyze data, as well as for creating the video series of learning videos are explained in chapter 4. Chapter 5 presents the results from the semi-structured interviews and focus groups. The results are discussed and reflected on in chapter 6. Lastly, the thesis is concluded in chapter 7.

CHAPTER

TWO

BACKGROUND

2.1 Definitions

The objective of the thesis is to provide guidelines on how to establish mentoring programs to increase gender diversity in computing academia. This involves retaining and preventing drop-outs among women in academia, including those at Bachelor to professor level. Throughout the thesis, the term "computing" is used as an umbrella term for STEM, IT, and computer science. Based on the objective, three fundamental terms are important to define: gender, diversity, and mentoring. Defining these terms is important to completely understand the research objective and to avoid any misinterpretations [17].

2.1.1 Gender

According to Pryzgoda and Chrisler, gender concerns socialized behavior patterns, which include someone's social and psychological characteristics and not their sex, i.e. the biological aspects of being a man or a woman [18]. This definition of gender allows for several interpretations regarding the number of genders that exist. In recent years, three categories are often used to describe one's gender: female, male, and non-binary. However, other perceptions of the number and categories of genders exist based on people's social and psychological attributes. This Master's Thesis focuses on retaining people who identify as females in computing academia.

2.1.2 Diversity

Diversity is a term that is often mentioned alongside gender. The term can be used in several contexts, such as biodiversity. However, in the workforce, diversity refers to who is represented in terms of race, gender, ethnicity, sexual orientation, ability, neurodiversity, etc. [19]. Additionally, the term often goes hand in hand with two other concepts, equity and inclusion, and is frequently referred to as DEI [19]. These concepts are attempted to be incorporated in all areas of society to

meet everyone's needs, such as in companies and study programs [19]. Gender diversity is a form of diversity that refers to the ratio of men, women, and non-binary people in a population [19].

2.1.3 Mentoring

Mentoring is a term that carries various definitions. According to Kram, mentoring is "a relationship between an older, more experienced mentor and a younger, less experienced protégé for the purpose of helping and developing the protégés career" [11]. Many definitions explain mentoring as a hierarchal and formalized relationship, but today, the term is commonly used as a synonym for supervising, advising, sponsoring, and coaching [11]. However, there are differences between these terms and their characteristics. What sets mentoring apart from the other terms is regular feedback, guidance, and psycho-social support [11]. This thesis uses Kram's definition of mentoring, except for the age aspect, i.e. a mentor does not have to be older than their mentee.

2.2 Sense of Belonging

Maslow states that humans have five basic needs [7], shown in figure 2.2.1. The first and most fundamental need is psychological needs, followed by safety, love and belongingness, esteem, and lastly, self-actualization [7]. A sense of belonging is an essential human need to make people feel connected [7], appreciated, and like they fit in [20]. In an educational context, it is defined as the degree to which the students feel respected, included, welcomed, etc. at a social level [7]. A sense of belonging is important in universities because the social process that takes place during collaboration with peers is considered important for students' learning [20]. Further, Dost et al. [7] state that students' academic motivation is associated with feeling a sense of belonging, and that students are more likely to engage in the university when they feel accepted, included, and like a part of the community.

In addition to academic improvements and greater engagement in university activities, there is observed a correlation between a sense of belonging and mental health problems [20]. Students who have a feeling of belongingness to their university are proven to have fewer study problems and fewer depression symptoms [20]. In addition, having a sense of belonging can prevent burnout, which tends to lead to reduced performance in school, study delay, and eventually drop-out [20]. Therefore, improving students' sense of belonging can be an initiative to reduce the drop-out rates in universities.

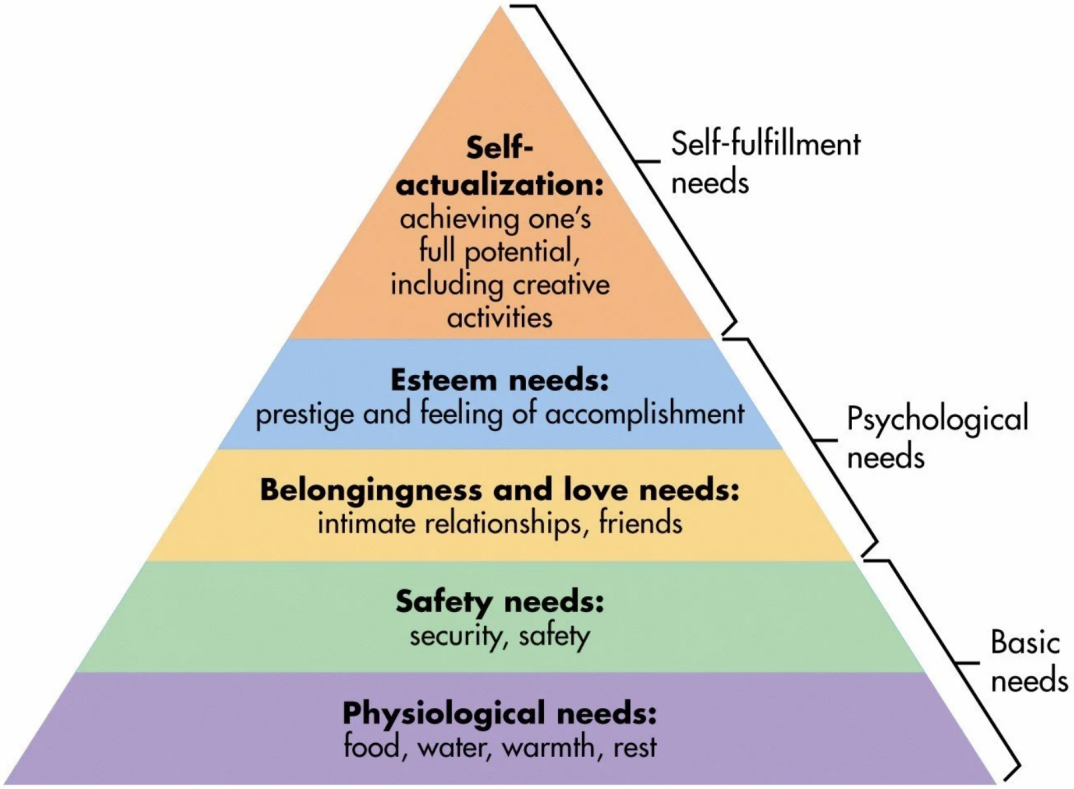


Figure 2.2.1: Maslow's pyramid of needs [21]

The importance of a sense of belonging in universities also counts for computing education. According to Holmegaard et al., [8], more people must choose computer science programs in higher education to follow the rapid digital and technological job market development. Recruitment of students to computer science programs has become an important field in research concerning computer science education. However, focusing on retaining the enrolled students is another important path to reduce the high drop-out rates among computer science students [8]. Retention includes both a social and an academic dimension, and research highlights that students' sense of belonging is crucial to ensure retention [8]. Further, it is proven that students' perception of their abilities is more dependent on their sense of belonging than performance [8].

Students have different prerequisites for experiencing a sense of belonging to their study program based on resources, background, experiences, and the study program's position in history and society [8]. The individual characteristics, such as gender and ethnicity, and contexts, such as relations to peers and institutional climate, can affect students' sense of belonging [7]. Women are an underrepresented group in the computing field and can therefore find it challenging to get a feeling of belongingness in computing programs. According to Viola, female students experience a lower sense of belonging because they constantly feel like they need to prove themselves to teachers and male students [6]. Additionally, belongingness is considered especially important for marginalized and underrepresented groups, such as females in computing programs [22].

2.3 Gender Diversity in Computing

Well-performing teams are important to active modern, scientific success [23]. It is proven that diverse teams are smarter and more creative, thus leading to new discoveries [23]. According to Trinkenreich et al. [3], a better understanding of user needs and alignment between software and the customer is more likely to occur for diverse software teams. Additionally, diversity increases productivity, innovation, and problem-solving, and tends to create a healthier work environment [3]. Gender diversity is especially important in the computing field due to the rapid growth of new technology and the use of technology in today's society. There are several examples of how technology created in a male-dominated field does not work for women to the same extent as it works for men. Smartwatches and smartrings struggle to separate pregnancy from illness, and face recognition works better for men than women [9]. Therefore, diversity is crucial in the development of new technology. In Norway, women make up 24% of STEM studies and 29% of the technology industry [9]. The challenges women face in the software industry can result in them leaving the field if diversity is not prioritized [3]. By understanding the reason why women leave projects or roles, one can create initiatives to avoid such drop-out [3].

A study conducted in Ericsson, a large global software development company, revealed several challenges faced by women in their company [3]. One is "prove-it again", which refers to women being evaluated more than their male colleagues and always having to prove their competence [3]. They also explained that they experienced a "glass ceiling", i.e. a barrier that prevents women from advancing their career [3]. According to Perez et al. [11], the "glass ceiling" prevents women from getting higher earnings and important decision-making positions in organizations. Further, the women in Ericsson experienced a "lack of peer parity", indicating a lack of role models, social challenges because men and women socialize differently, and an imbalance in the ratio of men and women in the company [3]. Additionally, women tend to feel self-doubt and find it challenging to internalize their accomplishments, also known as "impostor syndrome" [3].

Despite the challenges mentioned above being identified in the industry, they reflect the situation in computing academia as well. Women are underrepresented in academia, and they face barriers despite doing their best [11]. White men are more likely to achieve the feeling of belonging in STEM disciplines than women [6]. It is proven that despite performing equally, boys have a higher self-assessment of their math skills than girls, and are therefore more likely to take calculus courses [24]. Further, women's interest in the STEM field may be reduced by knowing that the field is perceived as male-dominated [24]. According to Holemgaard et al. [8], women tend to have more theoretical insights than coding experiences when enrolling in computer science programs, which can both be academically and socially challenging. Therefore, it is the organization's responsibility to realize the necessary changes that must be made and that these changes will benefit the whole organization, not just the women [11]. Further, the organization must implement strategies to support women, such as career development and mentoring [11].

2.3.1 Strategies to Increase Diversity in Computing

Due to the under-representation of women in STEM fields, women tend to be marginalized and excluded from networks [11]. Therefore, initiatives to support the retention of women are important to reduce the drop-out rates from academia and industry. The study conducted in Ericsson presented several actions on how to reduce the challenges faced by women in the company [3]. One is to support women's career growth by encouraging more women to take jobs in higher positions and to employ more women in leadership positions to break the glass ceiling [3]. Further, empowering women through publishing their success stories on social media and recognizing their work is important to reduce the feeling of impostor syndrome among women [3]. Lastly, the participants mentioned that peer parity can be achieved by arranging more events and groups that foster interaction between women from different departments [3]. One example of such an initiative is mentoring programs.

2.3.2 United Nations Sustainable Development Goal 5

The UN's SDG aims to achieve a more sustainable and better future, and all 17 goals are supposed to be achieved by 2030 [25]. UN states that gender inequality exists everywhere and that gender equality is a premise for a sustainable and peaceful world [5]. Therefore, SDG 5 was created to "achieve gender equality and empower all women and girls", and aims to end all discrimination against females [5]. More specifically, a part of the goal is to empower women through the use of information and communications technology (ICT) [5]. This thesis aims to contribute to achieving SDG 5 by empowering and supporting women in computing academia through mentoring programs.

2.4 Mentoring Programs

Mentoring has proven to be an important tool to encourage women's academic careers [11]. According to Bean et al. [13] in a paper addressing a long-term mentoring program in academia, new faculty experience more confidence and morale and do better work when having a mentor. Therefore, mentoring can contribute to building a successful career for new faculty [13]. The paper further highlights that women in male-dominated departments were offered less mentoring than their male colleagues [13]. Mentoring has also proven to be effective in the first years of entering a university to make the transition into higher education easier [12].

Mentors can have several roles: counselor, advisor, guide, tutor, trainer, advocate [13], friend, psychological support, and role model [26]. Even though a mentor is often described as a role model, it does not have to be the other way around. There is not necessarily any personal interaction between the role model and the person looking up to them. Therefore, one may copy ineffective behavior from the role model due to the lack of understanding [26]. This is contrary to a mentoring relationship, where the mentee is explicitly advised not to make the same mistakes as the mentor [27].

Mentoring in academia benefits mentors, mentees, and the university [14]. While

mentees can receive academic, personal, and professional support, the mentors can learn new skills in planning, leadership, communication, and decision-making [14]. Additionally, mentoring in academia tends to increase satisfaction among students, leading to lower drop-out rates [14]. Further, mentoring can be arranged between colleagues, where more experienced colleagues mentor less experienced colleagues [28]. According to Perez et al. [11], it is necessary to have sufficient financial resources when creating a mentoring program. However, arranging mentoring among colleagues can be an economical form of mentoring because it utilizes the organization's in-house experience [28].

2.4.1 Purpose and Goal

According to Perez et al.[11], the first step when establishing a mentoring program is to define the purpose and goals of the program. The intended outcomes for the participants must be decided, such as whether the program focuses on the participants' personal or career growth [11]. It is important to emphasize that mentoring needs can vary for the mentees depending on their level in academia [11]. A Doctor of Philosophy (PhD) student might need support in building a relationship with their supervisor or enhancing their research and presentation skills [11]. Whereas a mentee at a higher academic level can find mentoring on work-life balance and leadership skills more useful [11]. Therefore, it is important to create a program that can support mentees with different needs [11]. According to Bean et al. [13], it is also important to understand the culture where the mentoring is taking place. They add that several mentoring programs have failed due to not being sufficiently integrated into the culture of the organization [13].

A framework for the program should be established [11]. This can include expectations, guidelines, and timelines for the program [11]. If not, the program may be too informal, leading to difficulties in approaching and identifying with mentors, especially for mentees who are new in academia, such as junior faculty members [13]. Another disadvantage of too informal mentoring programs is the possibilities for gender and ethnic disparities in the mentoring [13]. Further, mentors and mentees must understand their responsibilities, such as complying with a confidential agreement [11] and being available for regular meetings [13].

2.4.2 Feedback and Follow-Up

It is important to offer support and guidance during the program if the participants face any concerns or challenges [11]. This can be received through regular check-ins [11]. According to Bean et al. [13], some mentees expressed that they only met their mentor once or never throughout two semesters, due to challenges related to scheduling meetings and the mentor being unavailable. Further, it can be an idea to provide the mentors with mentor training and resources, such as reading materials, templates, and toolkits to enhance their mentoring skills [11]. Mentor training and follow-up are especially important to promote participant engagement when the mentoring programs are remote or hybrid [29]. Additionally, it is beneficial to regularly evaluate the program and make adjustments based on the participants' needs [11]. Feedback from the participants can for example be collected through interviews or surveys [11].

2.4.3 Participants and Matching

After defining the objectives of the program, Perez et al. explain that the participants must be identified and recruited [11]. An application process can be used to evaluate whether the mentors are skilled and experienced enough to participate [11]. It is also important that the mentees are motivated to receive support and guidance [11]. Therefore, it is essential to communicate the benefits of participating in the program, as well as what is expected from the mentees [11]. Perez et al. further highlight some decisions that must be taken when recruiting mentors, such as whether the mentors and mentees should have the same gender, field of study, and come from the same university [11]. Additionally, it is crucial to have mentors from diverse backgrounds, contexts, and social origins [11], and it is proven that pairing/grouping mentors and mentees from different departments can be effective in guaranteeing confidentiality [11].

Mentors and mentees should be matched based on different qualities, as for example interests, goals, areas of expertise, personalities, and desired duration of the mentoring relationship [11]. There are three ways to match the participants: participant choice, uni-directional matching, and bi-directional matching [29]. The former refers to the technique where mentees choose their mentors based on a list of all of the mentors [29]. In uni-directional matching, the matching is based on the mentees' preferences, while in bi-directional matching, the mentors' and mentees' preferences are considered in the matching process [29]. If there are many participants involved in the program, an algorithm can be used [30].

According to Perez et al. [11], it can be advantageous that female mentees have female mentors since men often socialize differently than women. In addition, men's task engagement tends to be more competitive, whereas women tend to be more collaborative [11]. Similarly, Rhodes et al. state that women offer and respond better to caring and social help, as well as women historically have been perceived as vulnerable [31]. Whereas men offer and respond better to more heroic and instrumental help [31]. These factors tend to affect the mentor's behavior [31]. Thus women are more likely to offer more emotional mentoring, and it has been proven that friendship and personal support more frequently occur in mentoring relationships where all participants are women [31].

According to Bean et al. [13], participants in their program stated that pairing mentors and mentees from different disciplines created an environment where the mentees felt comfortable asking questions and sharing opinions without feeling like they were evaluated. However, having mentors from the same institution as the mentee can provide support relevant to that specific environment [11]. Perez et al. also expressed that it can be beneficial for the mentor and mentee(s) to meet in advance of the mentoring to create a good relationship before committing to the mentoring program [11]. Further, all parties must understand the importance of keeping the things discussed in the meetings confidential and respecting the other's privacy [11].

2.4.4 Relationship Type

Mentoring can happen in a group or one-on-one. Which approach is most suitable, depends on the objectives and goals of the program [32]. Therefore, it is recommended to first decide on the program's objective, and then decide on the relationship type [32]. The approach where several mentees are mentored by one or more mentors in a group is referred to as group mentoring [32]. While one-on-one mentoring is when the mentoring happens in pairs [32]. Further, mentoring often involves a more experienced mentor acting as an advisor for the mentee(s). However, colleagues and students can also mentor each other based on their strengths. This is known as peer mentoring [32]. Regardless of the relationship type, Perez et al. suggest that all the mentors and mentees gather at the beginning of the program to exchange ideas, network, and get an overview of the program [11].

The benefits of one-on-one mentoring are that the mentoring can be personalized to the mentee's needs, and it tends to create a deeper and lasting relationship between the mentor and mentee [33]. Bean et al. [13], explained that the participants in their mentoring program for mentees in academia describe one-on-one, confidential time with their mentor as the most helpful. On the other hand, an advantage of group mentoring is that the mentees can collaborate, and the participants can take advantage of the other group members' knowledge, not just their mentor's [32]. Therefore, group mentoring is often used if the objective of the program is skill development [33]. Further, group mentoring fosters professional networks for mentors and mentees [33]. Regardless of the program's objective, group mentoring should be arranged to allow the participants to network [11]. According to Bean et al. [13], a mentoring relationship is part of a larger network because a single mentoring relationship can not meet all the mentee's needs. Lastly, group mentoring benefits the mentors because working with several mentees can improve their leadership and coaching skills, and it is an efficient strategy when the program has access to a limited amount of mentors [33].

2.4.5 Delivery Method

Mentoring can be remote, hybrid, or in-person. The first refers to the mentoring happening via electronic devices [29], while in in-person mentoring, the participants meet face-to-face. The latter is a combination of the two. An advantage of remote mentoring is the access to more mentors and mentees due to communication across different locations [34]. Additionally, by not having to meet face-to-face, mentoring can still occur despite challenges like the COVID-19 pandemic. Other benefits remote mentoring yields are reduced costs and the opportunity to record the meetings [34]. However, a disadvantage of remote meetings is the misconceptions that can occur due to the lack of body language and the skills needed to use an electronic device [34]. Additionally, in-person meetings tend to create a greater sense of belonging, because the feeling of belonging and being physically present on campus are closely related to each other [35]. According to Albornoz et al. [35], virtual environments can not recreate all parts of being present.

2.4.6 Duration and Frequency of Meetings

The pairs or groups should decide for themselves the frequency and duration of their meetings [11]. However, in the study conducted by Bean et al. [13], there was a correlation between mentoring pairs who had the most frequent contact and the pairs who rated their relationship positively. Most pairs met in person once a month [13]. It can be an idea that the mentor initiates and leads the first meeting [11]. However, a mentor from the long-term mentoring program in academia addressed in [13] expressed that it must be conveyed that both the mentors and mentees are responsible for scheduling regular meetings.

2.5 Strategies to Increase Gender Diversity at NTNU

NTNU is Norway's biggest university, with 43,882 students (in May 2024), and has a main focus on science and technology [16]. "Knowledge for a better world" is the university's vision, and diversity, equal opportunities, and gender balance are important factors for achieving it [36]. However, there is a skewed distribution of the number of men and women who graduate from the technology study programs at NTNU. According to the graduation survey conducted by Abakus [1], the student organization for Computer Science and Cyber Security and Data Communication, in 2023, less than 32% of the students who graduated from Computer Science in 2023 were female, and only 1% identified as neither male nor female [37]. This is despite females receiving two extra gender-based points when applying for the five-year integrated Master's program. In spring 2023, the number of higher education programs offering gender-based points for women decreased from 123 to 31 [38]. In 2024, the number is reduced to 12 programs, with the majority being engineering programs [39]. Similarly, 12 programs in Norwegian higher education grant men with extra points [39].

It has been discussed whether gender-based points in higher education violate the European Union's (EU) gender equality directive. Despite the Ministry of Education and Research's conclusion that they do not, there is an ongoing discussion about removing the points and instead introducing quotas [38]. However, according to Reitan at NTNU [38], gender-based points have proven to be an efficient tool to reduce the gender imbalance in programs, and the number of women in engineering programs has decreased after removing the points. Such initiatives can contribute to reaching a critical mass of women in engineering programs, which according to Lagesen [40], is essential for creating a community of women and reducing the problems women face as a minority in the field, such as stereotypes, sexism, and unwanted attention.

Lagesen [40] also highlights the effectiveness of initiatives for recruiting more women to computer science study programs, by explaining The Women and Computing Initiative (WCI), the predecessor of Ada_ [2] at NTNU. This was a project started in 1997 due to the decreasing number of female ICT students [40]. The project involved a national advertising campaign, support for female students, and

[1] https://abakus.no/
[2] https://www.ntnu.edu/ada

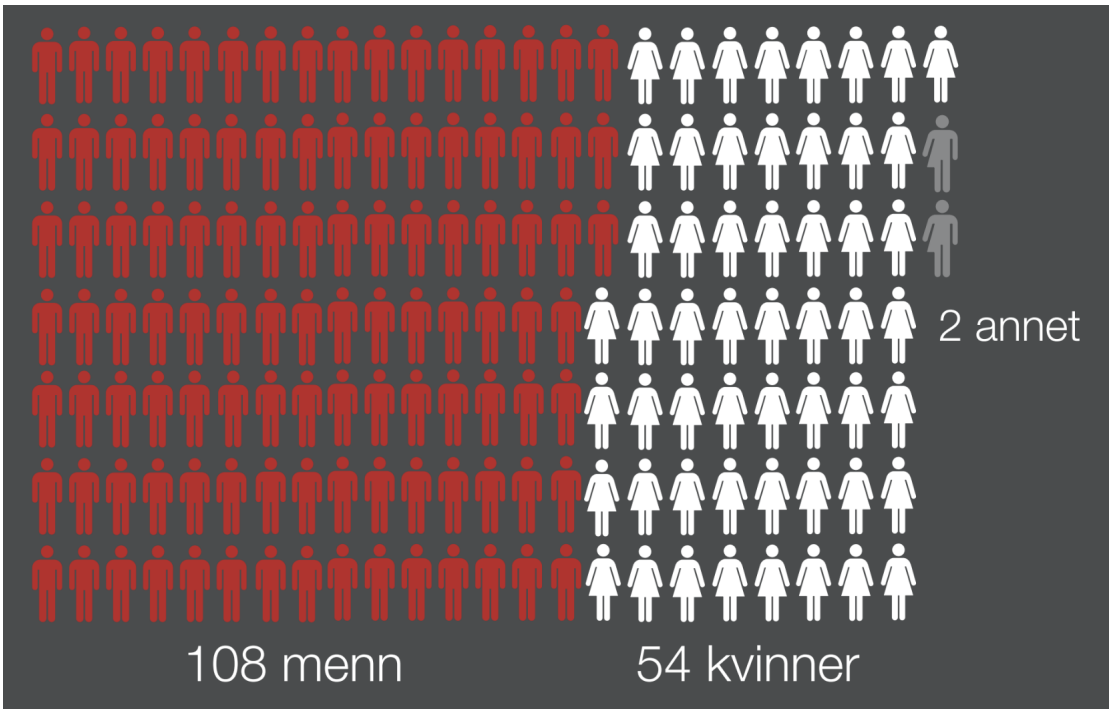


Figure 2.5.1: The number of men, women, and non-binary graduated from MSc in Computer Science at NTNU in 2023 [37]

a quota for females in the study program. Women became more aware of the program, they felt specially invited, and the percentage of female students increased from 6% to 36% [40]. However, the initiative proves that the number of female applicants decreases when initiatives stop [40]. This clarifies the importance of initiatives to recruit and retain female computing students.

2.5.1 Ada_

Ada_ is a project at NTNU that was established in 2010 as a reinvention of the WCI [40]. The project works towards graduating more women from the technology programs at NTNU with low female representation, by organizing events to increase the motivation and well-being among female students [41]. The project exists due to the need for more women in the technology industry, and the effect this gender imbalance will have on future technology [41]. 32 study programs at NTNU's Faculty of Information Technology and Electrical Engineering (IE) at Gjøvik, Trondheim, and Ålesund are included in the project, and all female students in these study programs are invited to their events [41]. Common for these study programs is the proportion of graduated women being less than 40% [41]. Additionally, the project collaborates with 47 member companies (in May 2024) to connect the students with the industry [41].

In 2020, Lagesen et al. [40] investigated whether there were any long-term effects of Ada_'s work. At the time [40], there were 17 engineering programs at NTNU and only five were included in the project. The results showed a trend of increasing numbers of female students in the five programs involved in Ada_, while not for the other programs [40]. The results are shown in figure 2.5.2. There is no evidence

that the results are due to Ada_'s work, but there is reason to believe that it has an effect [40].

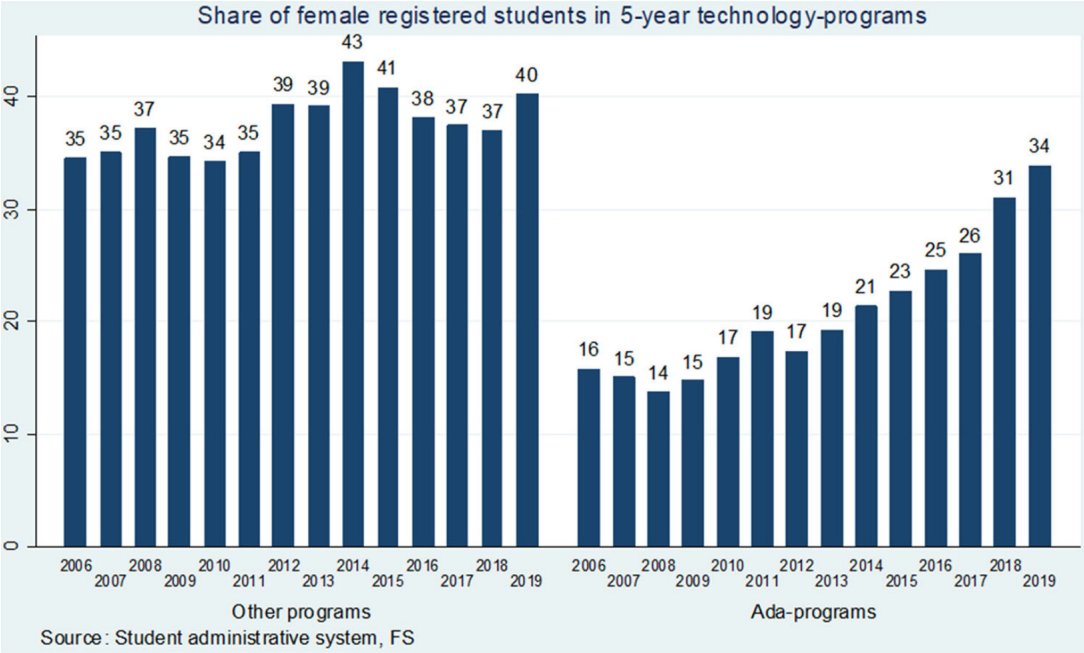


Figure 2.5.2: Proportion of female students in Ada_ programs vs other programs from [40]

Among lunches, motivational evenings, and networking events, Ada_ provides the students with a mentoring program called Ada_veileder [41]. This is a mentoring program for all students included in Ada_ who are in the third to fifth year of their studies where the student gets an experienced mentor from one of Ada_'s member companies who can answer their questions. The students submit a motivational letter as well as their study program and are then matched with a mentor. There have been three iterations of the program, where the first two lasted for a semester, while the latter lasted throughout the whole academic year 2023/2024. The pairs are obligated to meet at least three times each semester, but it is up to them when they want to meet and whether they want to meet remotely or in person. Further, all the pairs meet once a semester for a joint meeting over dinner.

Ada_veileder has no direct funding because it falls under the Ada_ project which is funded by their member companies and NTNU [40]. There are not many costs associated with the program except for the dinner where all pairs are gathered each semester, because mentors are representatives from Ada_'s member companies who join through their companies. Most of the work for Ada_ is related to promoting the program, and registration and matching the mentors and mentees.

2.5.2 IDUN - from PhD to Professor

IDUN was a project at NTNU operating from August 2019 to July 2022 aiming to improve the gender balance in the higher levels of academia [42]. The main goal of the program was to increase the proportion of females at PhD to professor level at the IE faculty at NTNU [43]. The project built on knowledge from

similar projects, such as Ada_ [42], and involved, among other efforts, a mentoring program for mentees from PhD level to associate professor level. Nine female professors from different countries were hired to mentor 40 mentees, both male and female, meaning that the project contributes to international mentoring programs [42]. The mentees were therefore mentored in groups consisting of three to five mentees each [43]. The Research Council of Norway and NTNU funded the project with 9.3 million NOK [43].

The program was structured to be adjusted based on the mentees' needs and be a place to build confidence, and share challenges, successes, and failures [42]. Additionally, IDUN aimed to help the mentees develop skills as researchers and gain motivation to continue with their work in the computer science and STEM fields. The mentees were provided with mentors who acted as role models and opportunities for networking and collaboration for both the mentors and mentees [42]. According to Jaccheri, the project leader of IDUN, having role models is a great way to gain a sense of belonging and community [42]. IDUN gave space to more women, as well as contributed to more diversity in several STEM fields [42]. The project experienced results that aligned with the program's goal. When the program started in August 2019, there were 13.8% female professors at the IE faculty at NTNU [42]. However, in 2021, the proportion had increased to almost 16.5%, showing the effectiveness of the mentoring program [42]. Additionally, IDUN contributed as a starting point for other initiatives working towards gender balance and diversity across all domains [42]. One being the Erasmus+ project Women STEM UP [42].

2.5.3 Women STEM UP

The Women STEM UP project started in November 2022 and involves five different institutions and organizations: Linköping University in Sweden, Panepistimio Thessalias In Greece, Stimmuli for social change also in Greece, NTNU in Norway, and Digital Leadership Institute in Belgium [15]. Similar to IDUN and Ada_, the Women STEM UP project aims to work towards gender balance in STEM higher education [15]. Despite educational institutions' interest in attracting women to STEM programs, there are limited examples to use as inspiration when creating support for females in STEM [15]. Therefore, the Women STEM UP project aims to create a bottom-up approach that can be used to encourage women to pursue a STEM education and career, especially within the ICT field [15]. The project is scheduled to last for three years and has a budget of 400k EUR [42].

The project's objective is to provide an open community and a platform for female undergraduate students and lectures, as well as tools and resources to empower women in STEM [15]. A virtual training program for lecturers and a leadership and inspiration academy platform are the future outcomes of the program [15]. The project consists of five deliverables [15], where NTNU is responsible for the third, also known as Work Package 3 (WP3), which involves the development of a leadership and inspiration academy [42]. This academy includes presenting role models, existing mentoring programs, guidelines for establishing mentoring programs, and training on how to be a mentor for female students [15]. This Master's Thesis contributes to completing the two latter.

CHAPTER

THREE

SYSTEMATIC LITERATURE REVIEW

This chapter is entirely based on the author's specialization project conducted in the previous semester in the course TDT4501 - Computer Science, Specialization Project titled: "Understanding Mentoring Programs for Increased Gender Diversity in Computing: A Systematic Literature Review" [1]. Most of the text is rewritten, but the content presented in table 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5, and 3.2.1, as well as figure 3.1.1 are taken from the specialization project.

The SLR was conducted in the autumn of 2023 as a preparatory study for the Master's Thesis [1]. The SLR aimed to research existing mentoring programs for women in the computing field, to identify patterns and gaps in the research. The study included 16 primary studies where each presented a mentoring program aiming to tackle the challenge regarding gender diversity in the computing field. Data from each study were extracted and analyzed to get insight into the research and gaps in the field.

3.1 Research Method

The SLR was based on Barbara Kitchenham's article on procedures for performing systematic reviews [44]. Kitchenham's paper provides guidelines for conducting systematic reviews, to identify, evaluate, and interpret research related to an RQ, topic area, or phenomenon of interest [44]. Further, reasons to conduct systematic reviews are explained, involving summarizing existing research, identifying gaps in the research, and examining the background of a topic to decide on new potential research [44]. Kitchenham presents five steps to conduct a systematic review: identification of research, selection of studies, study quality assessment, data extraction and monitoring progress, and data synthesis [44]. This chapter will elaborate on how each step was carried out in the autumn project.

3.1.1 Identification of Research

A SLR aims to use an unbiased search strategy to retrieve relevant primary studies [44]. A search string is created by breaking down the RQs and incorporating synonyms and is further used to search for primary studies in an electronic database [44].

The SLR aimed to summarize the current status and identify gaps in the research field, to justify the choice of research to be done in the Master's Thesis. Therefore, the phenomenon of interest for the autumn project was existing mentoring programs for females in computing. Several iterations of RQs and search strings were tried before the RQs in table 3.1.1 and search string in table 3.1.2 were formulated.

Research question	**Motivation**
What mentoring programs focusing on gender diversity in computing already exist?	Identify existing mentoring programs, to gain insight into the current status of the research area, as well as identify gaps in the research area.
What are the effects of mentoring programs focusing on gender diversity in computing?	Identify the effects the mentoring programs have on the participants.

Table 3.1.1: Research questions from the autumn project [1]

Three main areas were identified in creating the sophisticated search string presented in table 3.1.2. The first is mentoring programs, which is addressed by stating that all words starting with "mentor" should be included in either the title, abstract, or list of keywords of the primary study. The second is gender equality, which was addressed by including related words such as "inclusion" and "female". Lastly, only studies related to computer science are included in the search. Additionally, only studies written in English and published after 2012 were included to limit the number of potential primary studies and outdated research. An advanced document search was conducted in the academic database, Scopus, resulting in 366 studies.

Search string	Result
SUBJAREA(comp) AND TITLE-ABS-KEY (mentor* AND ("inclusion" OR "diversity" OR "gender equality" OR "women" OR "female")) AND PUBYEAR >2013 AND (LIMIT-TO (LANGUAGE, "English"))	366

Table 3.1.2: Search string from the autumn project [1]

3.1.2 Selection of Studies

Study selection is the second stage of a systematic review according to Kitchenham [44]. This step aims to find the relevant primary studies based on the RQs [44]. Therefore, the inclusion and exclusion criteria presented in table 3.1.3 were made to evaluate the relevance of the retrieved primary studies.

The title and abstract of the 366 studies were evaluated based on the inclusion and exclusion criteria. The criteria stated that the study had to address a mentoring program focusing on gender diversity in the computing field. Additionally, it had to be written in English, and published after 2012. 16 primary studies remained after the first screening. However, five more primary studies were included after assessing the studies' reference list and an additional search.

Inclusion criteria	Exclusion criteria
• The paper describes a mentoring program • The mentoring program focuses on gender diversity • The mentoring program operates in the computing field • The paper is written in English • The paper is published after 2012	• The mentoring program focuses on other perceptions of diversity • The mentoring program focuses on other perceptions of diversity as well as gender • The paper focuses on several interventions to achieve gender diversity, where a mentoring program is one of them

Table 3.1.3: Inclusion and exclusion criteria from the autumn project [1]

3.1.3 Study Quality Assessment

Assessing the quality of the chosen studies is the third step of conducting a systematic review [44]. In the quality assessment, the studies are assessed in more detail than in the previous stage. A goal in this step is to minimize bias and maximize validity [44]. Table 3.1.4 shows the criteria the 21 primary studies were assessed on, and figure 3.1.1 provides an overview of the number of studies in each

step of the SLR. Figure 3.1.1 is directly retrieved from the autumn project [1]. The 16 studies listed in table 3.2.1 remained after the quality assessment.

Quality assessment criteria
• The paper is an empirical study • The paper has a defined goal related to attracting and/or retaining women in computing • The study is based on relevant theory regarding the underrepresentation of women in computing • The paper provides the results from the study • The paper provides enough information to get an overview of the whole study • The study is not already included

Table 3.1.4: Quality assessment criteria from the autumn project [1]

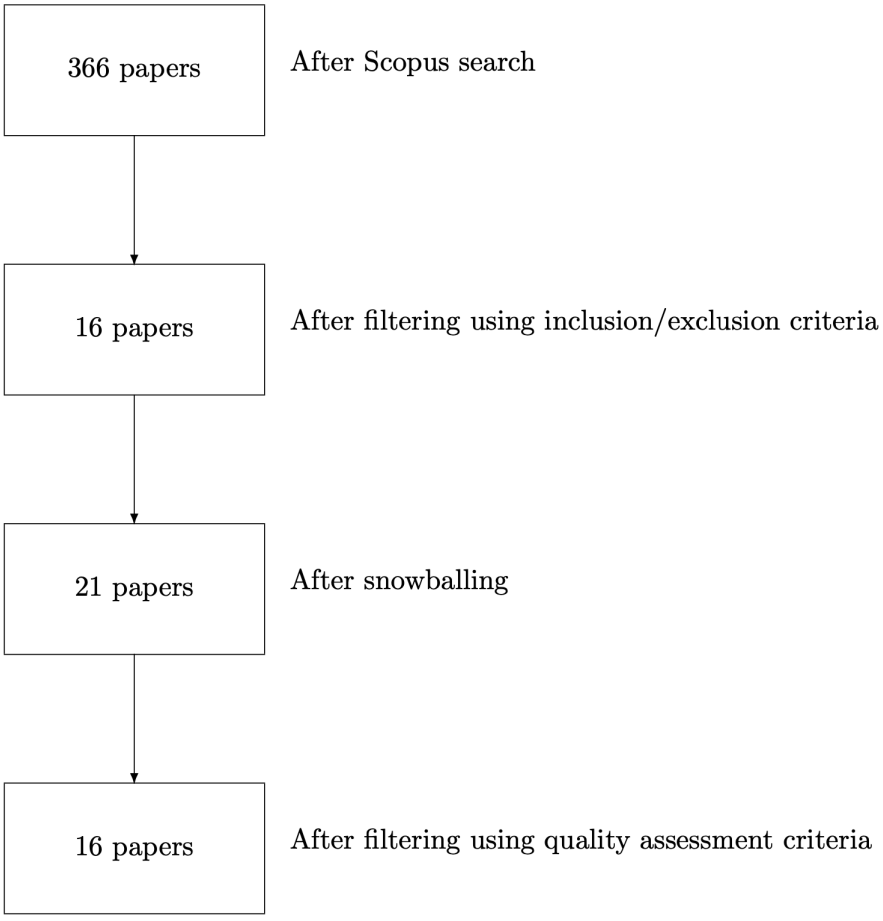


Figure 3.1.1: Number of studies during the SLR from the autumn project [1]

3.1.4 Data Extraction and Monitoring Progress

Data extraction is the next step in the review and involves collecting data relevant to answering the RQs [44]. The forms shown in table 3.1.5 are used to record the relevant information from the 16 studies. Both qualitative and numerical data about the mentoring program's method, content, and results are retrieved.

RQ1	RQ2
• Location • Delivery method • Duration • Purpose • Mentors • Mentees • Mentoring activities	• Qualitative vs quantitative • Results

Table 3.1.5: Data extraction tables from the autumn project [1]

3.1.5 Data Synthesis

The data collected from the 16 primary studies are categorized to provide a background of the research field and to identify gaps in the current research. For the first RQ, data about the country where the mentoring program was held, mentoring activities, duration, relationship types, delivery method, and participants' gender and experience level were collected. Information about the data generation method and results from the initiative were collected for the second RQ. Categories were made for each feature of the mentoring programs, to identify the areas that have been researched and the areas that require further investigation.

3.2 Synthesized Results

The 16 studies selected after the Scopus search are shown in table 3.2.1. Publishing year and author(s) are included with the title and a code to identify the study.

Study	Title	Publishing year	Author(s)
S1 [45]	Definition and Implementation of W-STEM Mentoring Network	2023	Alicia García-Holgado et al.

S2 [46]	Engaging Girls in Learning Engineering through Building Ubiquitous Intelligent Systems	2022	Mei Yang et al.
S3 [12]	Adapting to an unexpected hybrid campus: e-mentored female engineering students' intrinsic motivation, sense of belonging, and perception of campus climate	2022	Dr. Mayari Illarij Serrano Anazco et al.
S4 [47]	The Impact of Female Role Models Leading a Group Mentoring Program to Promote STEM Vocations among Young Girls	2022	Mariluz Guenaga et al.
S5 [14]	Mentoring for future female engineers: pilot at Higher Polytechnic School of Zamora	2021	Ana-Belén González-Rogado et al.
S6 [48]	"RemoteMentor" Evaluation of Interactions Between Teenage Girls, Remote Mentors, and Coding Activities in School Lessons	2020	Bernadette Spieler et al.
S7 [49]	A Coding/Programming Academy for 6th-Grade Females to Increase the Knowledge and Interest in Computer Science	2019	Sujing Wang et al.
S8 [30]	Exploring e-mentoring: co-designing & un-platforming	2019	Aseel Alhadlaq et al.
S9 [26]	From Beliefs to Intention: Mentoring as an Approach to Motivate Female High School Students to Enrol in Computer Science Studies	2018	Bettina Finzel et al.
S10 [50]	Social Enterprise Model for a Multi-Institutional Mentoring Network for Women in STEM	2018	Dr. Sara A. Atwood et al.

S11 [51]	Dancing Robots: A Collaboration Between Elementary School and University Engineering Students	2017	Mandy Mclean et al.
S12 [52]	An Effective Industry-Based Mentoring Approach for the Recruitment of Women and Minorities in Engineering	2017	Abby Ilumoka et al.
S13 [34]	Balancing the Equation: Mentoring First-Year Female STEM Students at a Regional University	2017	Jackie Reid et al.
S14 [53]	Investigating the Role of Being a Mentor as a Way of Increasing Interest in CS	2016	Jody Clarke-Midura et al.
S15 [54]	The effectiveness of a one-year online mentoring program for girls in STEM	2013	Heidrun Stoeger et al.
S16 [55]	Remote Mentoring Young Females in STEM through MAGIC	2013	Ritu Khare et al.

Table 3.2.1: Primary studies from the SLR [1]

3.2.1 RQ1: What mentoring programs focusing on gender diversity in computing already exist?

Nine characteristics of the mentoring programs were identified when reading the primary studies: location, mentoring activities, duration, relationship type, delivery method, mentors' gender and experience level, and mentees' gender and experience level. Further, these characteristics were split into categories to get insight into the areas the current research had focused on, as well as areas for further research. Table 3.2.2 summarizes the characteristics, categories, and the respective mentoring programs.

Half of the mentoring programs were offered in the United States, five in Europe, one in Australia, one in the Middle East, and one was conducted in several Latin American countries and Spain. These results indicate that 14 of the 16 primary studies (88%) were conducted in the Global North, whereas only two (12%) were conducted in the Global South.

The contents of the mentoring programs are classified as mentoring activities and categorized into four categories: meetings, interactive activities, presentations, and forums. Meetings between the mentor and mentee(s) were the most commonly used activity and were present in nine of the 16 mentoring programs. The second most used activity was interactive activities which involved projects and tasks. This approach was identified in eight mentoring programs. Further, six programs involved presentations, and one mentoring program offered a forum to the participants.

Matching the mentee with a suitable mentor was included in six programs. The matching was based on different variables, including gender, availability, interest, location, etc.

The mentoring program's duration was categorized into three categories consisting of less than one month, one to twelve months, and one year or longer. Two mentoring programs lasted less than one month, eight lasted between one and twelve months, and four lasted one year. Despite some programs involving several iterations of the mentoring program, no mentor-mentee relationships lasted longer than one year.

Whether the mentees were mentored in a group or one-on-one with the mentor was another categorization. Six mentoring programs arranged one-on-one mentoring sessions between a mentor and a mentee, often consisting of meetings. Four mentoring programs used exclusively group mentoring. Interactive activities and presentations were often seen in combination with this mentoring approach. Lastly, four programs used a combination of one-on-one and group mentoring, and the last two programs did not mention the mentoring approach.

The delivery method of the programs is categorized into in-person, remote, or hybrid mentoring programs. Seven programs were in-person, six were remote, and three were a combination of both. Email, Zoom [1], and Discord [2] were some of the online communication platforms that were used in remote mentoring programs.

Binary gender was used to classify the participants' gender. Seven programs used exclusively female mentors, eight used both male and female mentors, and one did not specify the gender of the mentors. However, eleven programs used exclusively female mentees, and only five mentoring programs were offered to both male and female mentees. People who identified as male were more present in the role of mentors than mentees. The participants' experience level was categorized as K-12, higher education, or industry, where K-12 refers to the grades starting from kindergarten to high school according to American educational stages. Ten of the 16 mentoring programs used mentors from higher education and six programs used mentors from the industry. Only one program did not specify the mentors' level of experience. For the mentees, eleven programs were offered to K-12 students. Whereas, four were directed toward students in higher education, and only one program aimed to mentor women from the computing industry.

[1] https://zoom.us/
[2] https://discord.com/

Characteristics	**Categories**	**Number of programs**	**Mentoring programs**
Location	The Global North	14	[46] [12] [47] [14] [48] [49] [26] [50] [51] [52] [34] [53] [54] [55]
	The Global South	2	[45] [30]
Mentoring activities	Meetings	9	[14] [12] [45] [50] [55] [34] [54] [48] [30]
	Interactive activities	8	[49] [52] [53] [51] **2** [26] [55] [48]
	Presentations	6	[52] [45] [46] [26] [47] [34]
	Forums	1	[54]
Duration	$<$ One month	2	[49] [53]
	One month - twelve months	8	[14] [12] [51] [46] [26] [55] [34] [30]
	$\geq$ One year	4	[52] [50] [54] [48]
Relationship type	Group	4	[52] [51] [26] [47]
	One-on-one	6	[14] [49] [55] [34] [48] [30]
	Both	4	[12] [45] [46] [54]
Delivery method	In-person	7	[49] [52] [53] [51] [45] [26] [47]
	Remote	6	[14] [12] [55] [54] [48] [30]
	Hybrid	3	[46] [50] [34]

Mentors' gender	Female	7	[49] [53] [12] [50] [55] [54] [30]
	Female and male	8	[14] [52] [51] [45] [26] [47] [34] [48]
Mentors' experience level	K-12	0	
	Higher education	10	[14] [49] [53] [12] [51] [45] [46] [26] [54] [48]
	Industry	6	[52] [50] [47] [55] [54] [30]
Mentees' gender	Female	10	[14] [49] [52] [12] [45] [46] [50] [55] [34] [54]
	Female and male	5	[53] [51] [26] [47] [48]
Mentees' experience level	K-12	11	[49] [52] [53] [51] [46] [26] [47] [55] [54] [48] [30]
	Higher education	4	[14] [12] [45] [34]
	Industry	1	[50]

Table 3.2.2: Summarized results

3.2.2 RQ2: What are the effects of mentoring programs focusing on gender diversity in computing?

Several data collection methods were used to measure the effects of the mentoring programs. The most commonly used method was questionnaires, which were used in twelve studies. Some studies used pre- and post-questionnaires to measure the effect of the program, and some used treatment and control groups to compare the answers from participants in the mentoring program to the answers of people who did not participate in the program. Further, four studies used interviews to collect more detailed data. Data that was collected continuously through the mentoring program is classified as continuous feedback and was used in three studies. Focus groups consisting of several participants were used in two studies. One study used a skill test to assess the participants' programming skills before and after participating in the mentoring program. Lastly, one study used the participants' drawings of an engineer before and after participating as data.

All studies addressed challenges women frequently face in the computing field in

the results. Therefore, the topics that were mentioned in the results were classified into self-inflicted challenges and social challenges. Further, the two classes were categorized into six categories. Knowledge/skills, confidence/self-efficacy, and interest/motivation were the three categories that fell under self-inflicted challenges. These challenges arise from our thoughts and actions. However, social challenges are social phenomenons created by society. Sense of belonging, role models, and stereotypes are used to categorize this class of challenges.

Positive changes in the participants' knowledge and skills were observed in seven of the 16 studies. One study reported no change in this category. Participants in eight studies reported positive changes in their confidence and self-efficacy in computing. However, two studies did not observe any change in the participants' computing confidence and self-efficacy. Lastly, six studies reported a positive change in the participants' motivation and computing interest.

For the social challenges, four studies observed positive changes in the participants' sense of belonging in the field. One program reported an increase in role models. Lastly, participants from one program experienced that the stereotypes they had of computer scientists decreased and one program observed no changes in the participants' stereotypes in the computing field.

3.3 Conclusion

3.3.1 RQ1: What mentoring programs focusing on gender diversity in computing already exist?

The SLR identified several gaps in the research. 14 of the 16 studies identified in the research were conducted in the Global North, indicating that more research should be done on mentoring programs focusing on gender diversity in computing in the Global South. The study also suggests that more research should be conducted on long-term mentoring programs, as only 25% of the programs lasted for a year, and no mentor-mentee relationships lasted for a longer period. Lastly, more research should be directed towards mentoring women in higher education and industry, i.e. there should be more focus on retaining rather than attracting women to the field.

3.3.2 RQ2: What are the effects of mentoring programs focusing on gender diversity in computing?

The study revealed that most research uses the participants' own experiences to evaluate the program. Therefore, the SLR suggests that more research should provide long-term effects and statistics to show the results, such as drop-out rates and the share of women before and after the program.

3.3.3 Limitations

There were several limitations to the study. Most programs used questionnaires for evaluation, which only provided brief, subjective feedback. Further, the mentees'

young age, due to the mentoring programs targeting K-12 students and many of the programs' short duration may limit the validity of the results.

CHAPTER

FOUR

METHODS

4.1 Research Questions

The phenomenon of interest in the research is the inclusion of women in computing academia. The SLR conducted in preparation for this study discovered that there is limited research done on mentoring programs for women in computing academia [1]. The majority of the research on mentoring programs for women in computing aims to attract more women to the field, instead of retaining women in academia and industry. In addition to the findings from the SLR, this research is part of the Women STEM UP project at NTNU, which involves the development of a leadership and inspiration academy [15]. A set of goals is defined which aims to create the academy. This involves the development of guidelines for establishing mentoring programs to connect female students with professionals within the STEM field, as well as guidelines on how to mentor female students [15].

Based on the main findings from the SLR [1] and the goals of the Women STEM UP project [15], the scope of the research was narrowed down to creating guidelines for establishing mentoring programs to retain women in computing academia. A video series of animated learning videos is created to present the results of the research. Animation videos are an effective way to communicate complex ideas simply [56] and are suitable for the Women STEM UP website. Based on the scope, the two RQs presented in table 4.1.1 were defined.

Number	Research Question	Motivation
RQ1	What factors should be taken into account when designing a mentoring program for women in computing academia?	Guide individuals establishing mentoring programs in the decision-making process when developing a framework for the program.
RQ2	What considerations and qualities should mentors have when mentoring women in computing academia?	Guide individuals establishing mentoring programs on choosing suitable mentors. Additionally, assist mentors on which behaviors to adopt when mentoring females in computing academia.

Table 4.1.1: Research questions

4.2 Theory

4.2.1 Qualitative Methods

According to Recker [57], qualitative methods are used to understand phenomena in context and are often used to study social and cultural phenomena. Data used in qualitative methods are non-numeric, such as images, words, sounds, etc. [58]. This data type is called qualitative data and is often collected through interviews, company documents, websites, research diaries, and so on [58]. Text involving information about things people have said, done, experiences, etc. regarding a topic, phenomenon, or event is essential in these methods [57]. Abstract units are defined based on themes and patterns identified by analyzing the retrieved data, which is used to understand the participants' view on a phenomenon [57].

Unlike quantitative methods, the researcher is a crucial part of the data collection process, because the researcher often collects data using interviews, observations, etc. [57]. Further, the theories resulting from the research are often based on the researcher's interpretations, which means that the conclusions drawn about the phenomenon of interest are the researcher's subjective opinions [57]. The author of this Master's Thesis is a woman studying computer science at NTNU in Norway. Being a student in Norway may impact the thesis, as the country's robust economy may make it easier to establish mentoring programs in universities compared to countries in the Global South. Further, the author has not participated in any mentoring programs during her education. Therefore, she does not have any personal experiences and opinions on how a mentoring program should be structured and how mentors should behave.

4.3 Interviews

The research involved twelve semi-structured interviews with people who had been involved in either Ada_veileder or IDUN, two mentoring programs at NTNU. The

interviews were recorded using Microsoft Teams [1], which automatically generated transcriptions. However, the author listened to the audio recordings after the interviews and made changes in the transcriptions to facilitate understanding. Quotes were manually transcribed, as well as translated to English when writing chapter 5.

Interviews are a frequently used method to gather data in qualitative studies. This data collection method can be used to understand the interview objects' perspectives on a phenomenon and define questions for further research [57]. Semi-structured interviews involve using an interview protocol as a framework, but also allowing follow-up questions and bidirectional discussions [57]. This is the most common interview technique [57]. By using a semi-structured interview method and opening up for follow-up questions, the interview becomes more flexible and tends to be more efficient when discussing sensitive topics because the interview encourages two-way communication [57]. Additionally, interview studies are an efficient way to explore the participants' feelings, emotions, and experiences, which can be challenging to collect through questionnaires. However, according to Oates [58], the participants' answers can depend on their perception of the researcher. Therefore, the researcher's age, gender, status, etc. can influence the participants' responses [58].

The Association for Computing Machinery (ACM) Special Interest Group on Software Engineering (SIGSOFT) [2] aims to improve software engineering by creating a forum for researchers, practitioners, and educators [59]. SIGSOFT has created empirical standards to increase review quality, paper quality, and acceptance rates, as well as create agreement on research practices. Empirical standards imply listing attributes and practices related to methodologies [60]. The standards for interview studies contain among other things the four points listed below:

- "Researcher(s) have synchronous conversations with one participant at a time" [60]
- "Researchers ask, and participants answer, open-ended questions" [60]
- "Participants' answers are recorded in some way" [60]
- "Researchers apply some kind of qualitative data analysis to participants' answers" [60]

Despite SIGSOFT's first point, stating that researcher(s) have conversations with one respondent at a time [60], Oates highlights that group interviews, consisting of several participants interacting and discussing, also is an interview method [58]. The benefits of group interviews are more variation in responses, creating consensus views, and the opportunity to highlight themes [58]. Regarding SIGSOFT's third point, addressing that the respondents' answers should be recorded [60], Oates explains that the recordings can include notes, audio, and video [58]. Further, Oates highlights the importance of ensuring that the participants know how the data collected from the analysis is used, published, and stored [58]. Addi-

[1] https://www.microsoft.com/en-gb/microsoft-teams/group-chat-software
[2] https://www2.sigsoft.org/

tionally, the participant must be informed that they can stop and withdraw their consent whenever they want to [58].

4.3.1 Participants

SIGSOFT's empirical standards further state that it is essential to document how the interviewees are selected, as well as a description of the participants [60]. Oates also mentions the importance of looking into the participants' background information, because it can save time during the interview and enhance the researcher's credibility [58]. Diversity in the participants is another attribute that is desirable in interview studies because the lack of diversity in the participants can create an illusion of convergence [60].

The author aimed to interview women involved in mentoring programs at NTNU. Six participants from IDUN and six participants from Ada_veileder were recruited. All respondents from IDUN had been mentees in the program. Whereas, the study includes interviews with mentors, mentees, and organizers of Ada_veileder. This is because several of IDUN's mentors are now based in universities outside of Norway and the people involved in Ada_veileder were easily accessible. Respondents from IDUN were recruited through NTNU's website about IDUN, and the respondents from Ada_veileder were recruited through NTNU's website about Ada_, as well as LinkedIn [3].

Table 4.3.1 gives a summary of the respondents, including their corresponding mentoring program, role, and the language used in the interview. Nine of the twelve interviews were conducted in Norwegian. Therefore, quotes used in chapter 5 are translated into English. Further, the respondents are identified with a code consisting of the letter "R" which stands for "respondent", and a number from 1 to 12 representing each participant. This code will be used throughout chapter 5.

4.3.2 Interview Guide

The interviews aimed to get insight into how the mentoring programs were structured and the participants' experiences, to get an idea of what to do and what to avoid when establishing a mentoring program and being a mentor. Appendix A contains the two interview guides used in the study. One guide was used to interview mentors and mentees, and another was used in the interviews with the organizers of Ada_veileder. The guides were created based on the findings from the SLR and therefore included questions regarding most of the main categories from the SLR results, such as mentoring activities, duration, relationship type, and delivery method. However, other topics were also added, such as recruitment, matching, changing mentors, feedback, and mentor training. The respondents were also asked to reflect on what they think worked and could be improved in the program, and what is most crucial to consider when creating a mentoring program for women in computing academia. Additionally, the respondents reflected on the positive and negative aspects of their mentor and what they consider important qualities of a mentor.

[3] https://www.linkedin.com/

Respondent	Role	Mentoring Program	Interview Language
R1	Mentee	IDUN	Norwegian
R2	Mentee	IDUN	Norwegian
R3	Organizer	Ada_veileder	Norwegian
R4	Mentee	Ada_veileder	Norwegian
R5	Mentee	IDUN	English
R6	Mentee	IDUN	English
R7	Organizer	Ada_veileder	Norwegian
R8	Mentee	IDUN	English
R9	Mentee	IDUN	Norwegian
R10	Mentor	Ada_veileder	Norwegian
R11	Mentee	Ada_veileder	Norwegian
R12	Mentor	Ada_veileder	Norwegian

Table 4.3.1: Interview repondents

4.4 Qualitative Data Analysis

According to Oates [58], qualitative data analysis concerns abstracting themes and patterns from the research data that the researcher finds important for the topic. Before analyzing, the data must be transcribed and be in the same format [58]. Further, where and how the data should be stored must be planned, and all data must be duplicated to avoid harming or losing the data [58]. Oates further states that identifying themes and patterns in the data can be achieved by first categorizing the data into the three categories that are listed below [58]:

- Data outside the research scope [58]
- General data describing the research context [58]
- Data relevant to the RQ(s) [58]

Further, the data relevant to the RQ(s) must be categorized by using either a deductive or inductive approach [58]. A deductive approach involves categorizing the data based on existing theories, for example, found in the literature. Whereas an inductive approach involves creating categories while reading the data [58].

After categorizing the data, the researcher can look for patterns in the data from the same categories. Additionally, tables and diagrams can be a useful tool for visualization in the data analysis process [58]. Lastly, the researcher(s) will explain the patterns in the data and try to connect them to literature, political and social contexts, etc. [58]. Recker [57] defines this qualitative data analysis method as coding, where labels are assigned to data to organize and create categories. This is the most frequent method for qualitative data analysis [57].

Analyzing qualitative data is subjective and relies on the researcher's interpretations [57]. Recker [57] has defined several principles to achieve rigor, i.e. trust and confidence [61], in the research findings. The first is dependability, which involves showing that others draw the same conclusion as the researcher based on the same data [57]. Credibility concerns having enough evidence for the interpretations done in the analysis [57]. Further, confirmability is achieved if outsiders such as interviewees who can confirm the findings will verify the findings from the research [57]. Lastly, transferability describes to what extent the findings can be generalized to other domains [57].

The analysis of the data from the twelve interviews was done in two iterations. Before the first iteration, the author read through the transcribed interviews and wrote down all mentioned topics that are relevant to the RQs as the first step to creating categories for the data. This step resulted in the ten categories presented in table 4.4.1.

Initial categories from interviews
• Expectation clarification • Mentor qualities • Matching • Duration of the program/frequency of meetings • Group vs one-on-one • Remote vs in-person • Benefits/gains for the mentor • Topics of conversation • Importance of such programs • Feedback

Table 4.4.1: Initial categories from the interviews

4.4.1 First Iteration

After defining the first set of categories, all interviews were listened to and read through simultaneously with writing down points the respondents said on sticky notes on a Figma [4] board and placing them inside boxes representing each category. Each color represents one respondent, and the data was written in English and Norwegian based on the language that was used during the interview. Not every

[4]https://www.figma.com/

note was a good fit within a category. However, the classification would be revised in the next iteration. The Figma board for the first iteration of the data analysis is shown in figure 4.4.1.

Figure 4.4.1: Figma board of the first iteration of the data analysis

4.4.2 Second Iteration

In the second iteration of the data analysis, the author revised each category and created subcategories based on the sticky notes. Some notes were moved to other categories and some were removed because they were considered irrelevant. Three of the main categories from the previous iteration: topics of conversation, importance of such programs, and feedback were also removed or merged into another category because the author did not consider them important enough to stay as own categories. Further, the author wrote down important points from the data in each subcategory. This structure and points became the starting point for the video series of animated learning videos explained in chapter 4.5. The Figma board for the second iteration of the analysis is shown in figure 4.4.2. Table 4.4.2 presents the final categories and subcategories used in the video series and chapter 5.

Categories	Subcategories
Expectations	• Communicating the goal and expectations • Follow-up • Feedback
Matching	• Application process • Location • Experience • Field of study • Gender
Duration	• Length of the program • Frequency of meetings
Delivery method	• Benefits with remote mentoring • Benefits with in-person mentoring • Hybrid meetings
Relationship type	• Benefits with one-on-one mentoring • Benefits with group mentoring • Joint meetings and events • Change groups and mentors
Mentor's benefits	• Recruitment for own company • Mentor versus supervisor
Mentor qualities	• Role model • Initiative • Interest • Experience • Understanding • Supportive • Mentor training

Table 4.4.2: Categories and subcategories after the second iteration of the data analysis

Figure 4.4.2: Figma board of the second iteration of the data analysis

4.5 Design and Creation

Oates states that it is essential that research projects involving designing and developing a computer-based product contribute to knowledge [58]. The artifact produced in the design and creation process can be the main contributor to knowledge. However, in some cases, it may be one of many strategies used in a study, and the artifact acts as a vehicle for something else, such as a "How-to" video for a specific audience that presents the results from the literature and field research [58]. Regardless of what the artifact is, a design and creation process often follows the five-step iterative process presented below [58]:

- **Awareness** involves recognising the problem [58]
- **Suggestion** is offering a tentative idea of how the problem can be addressed [58]
- **Development** is implementing the said idea [58]
- **Evaluation** assesses the developed product [58]
- **Conclusion** involves writing up the results from the process and identifying the gained knowledge [58]

The design and creation phase of the thesis consisted of creating a video series of animated learning videos explaining what to consider when developing a mentoring program for women in computing academia and what to consider when being a mentor. Organizers of mentoring programs for women in computing academia and mentors in such programs are the intended target group, to guide them in the mentoring and decision-making process. The videos were created in two iterations, where the second iteration involved improving the first videos based on feedback from focus groups. The video series is uploaded to the author's YouTube [5] channel, and will be posted on the Women STEM UP website. The videos are linked in the preface.

It is essential to document the design and creation phase by explaining the system development method, i.e. what the analysis, design, implementation, and testing stages involved. This methodology can either be a defined process as Agile development or it could be something unique to the researcher's specific project [58].

The videos were made using PowerPoint [6], iMovie [7], Apple's Voice Memos app [8], and Uppbeat [9], due to the author's experience with these frameworks and no costs. PowerPoint was used to create the animations by making slides for each frame and setting a timer to set the duration of each frame. Voice Memos was used to record the sound in the second iteration of the video creation to improve the quality and avoid clicking from the trackpad. iMovie's audio recording feature was used in

[5] https://www.youtube.com/
[6] https://www.microsoft.com/en-us/microsoft-365/powerpoint
[7] https://www.apple.com/ca/imovie/
[8] https://apps.apple.com/gb/app/voice-memos/id1069512134
[9] https://uppbeat.io/

the first iteration. Uppbeat is a website with music that creators can download for free without getting issues with copyright [62]. This was used to download the background music used in the videos. iMovie was used to put the video and sound together. A total of 152 slides were created in the first iteration and the length of the video was estimated to be over 20 minutes, explaining every topic mentioned in table 4.4.2. However, due to the length being too long to use in the focus groups, the video was divided into a video series of seven videos explaining one category each. Each video was estimated to last for about 1-5 minutes. Table 5.3.1 presents the slides created for the frames in the first video, explaining the importance of communicating the expectations and goals for the program.

According to Azzajjad et al., learning video media uses audio and visuals to convey learning messages. It is a learning method where senses such as hearing and sight are used which can be beneficial when communicating teaching materials [63]. Animation videos can be used as learning videos, and can effectively capture the audience's attention, offer interactive learning, and explain concepts easily and visually [56]. Videos communicate messages more effectively than text because they add interactivity and personalization [63]. Similar to other design processes, it is essential to define a goal for creation, scope the content, and research the users to understand their needs. Further, the specifications of the video, such as style and length, must be planned [63].

Creating animation videos can demand high costs, and skills, and often involves tedious work [64]. However, there are ways to create an animation video depending on budget, resources, and goals [56]. Professionals can be hired to create the video, and online platforms for creating animation videos can be used [56]. When creating animation videos, it is important to connect with the audience by using visuals and audio of good quality, as well as using text such as subtitles and captions to include a broad audience [56].

Lastly, the animation video should be tested by professionals and the targeted audience to ensure that the users' expectations are met and to validate the design [56]. In advance of publishing the video, professionals, and users can watch the video and provide feedback. After the video is published, views, watch time, conversations, etc. can be measured using analytic tools [56]. In this study, the videos were tested in focus groups.

4.6 Focus Groups

There were two iterations of gathering feedback on the video series. Changes were made to the videos after the first iteration. However, due to time restrictions, most feedback from the last iteration was not implemented. Focus groups were used to get feedback on the video series, by observing the participants watching the video and asking questions afterward. This is also known as group interviews, which tend to include three to six participants [58]. According to Oates [58], the participants in the focus groups should discuss and interact to generate consensus views and gather more responses. Further, Oates suggests including another researcher when having focus groups, where one can take notes and another can lead the discussion

[58].

Only two of the seven videos were evaluated in the focus groups due to time restrictions. However, it was still considered valuable because the seven videos had the same format. Therefore, the feedback on the two videos can be used to make changes in the five remaining videos. There were two focus groups in the first iteration of the design and creation phase, i.e. two focus groups were presented with two of the original videos. It was only one focus group in the second iteration due to the difficulty of recruiting participants. The groups consisted of three to four participants, and individuals of all genders were invited to participate. Three participants were recruited when the author presented the thesis at a conference for students and employees at the Department of Computer Science at NTNU: Catch IDI 2024. A QR code leading to Microsoft Forms [10] was added as the last slide of the presentation. Two participants also participated in the interviews, and six were from the author's personal contacts. Despite the participants in the focus groups not being the video series' target group, they could give valuable feedback on the video format, as well as comments on when the content was unclear.

The first video the participants were presented with explained the importance of communicating the expectations of the program and the second was about the duration of the mentoring program. Further, they were asked to give feedback on both the content and the format after watching each video. Because the author did not have a referent during the focus groups, the participants were given a paper divided into four sections: positive comments on content, constructive criticism on content, positive comments on format, and constructive criticism on format. The participants were asked to spend a few minutes after the video to take notes to make it easier for the author to remember the feedback. Thereafter, they could discuss the feedback with the other respondents.

4.7 Ethics

According to Oates [58], most institutions, such as NTNU, require the research to be ethically approved before it starts to ensure that people participating in the research will not get harmed and will be treated with dignity. Therefore, notification forms were sent to Sikt [11], The Norwegian Agency for Shared Services in Education and Research, and approved before the interviews and focus groups were held. The form for the interviews is provided in appendix B, and the form for the focus groups in appendix C. Further, all participants in the interviews and focus groups were asked to sign an information letter explaining what their participation involves, what their personal data will be used for, and how to withdraw from the research. Oates states that all individuals should have the right to give informed consent after they have been informed about the research and their participation [58]. Further, participants must be informed that they have the right to remain anonymous, withdraw from the research, and that their data is confidential [58]. The information letters the participants involved in this research were provided with are based on the information letter from a presentation on

[10] https://www.microsoft.com/en-us/microsoft-365/online-surveys-polls-quizzes
[11] https://sikt.no/en/home

Data Processing and Research Ethics in one of the Software For A Better Society [12] meetings in which the author participated. The information letter used for the interviews of mentors and mentees is shown in appendix D. Similar information letters were used for the interviews with program organizers and focus groups.

[12]https://sbs.idi.ntnu.no/

CHAPTER

FIVE

RESULTS

The data from the interviews of mentors, mentees, and organizers of the two mentoring programs at NTNU, Ada_veileder and IDUN, could be divided into seven categories: expectations, matching, duration, relationship type, delivery method, mentor qualities, and mentor's benefits. The first five categories should be considered when developing the frameworks of a mentoring program and are therefore used to answer RQ1. Whereas the last two categories describe what one should think about as a mentor and are used to answer RQ2. The remaining data from the interviews were excluded during the data analysis because they were not relevant to answering the RQs. The seven categories are divided into subcategories to further organize the data.

5.1 RQ1: What Factors Should Be Taken Into Account When Designing a Mentoring Program for Women in Computing Academia?

5.1.1 Expectations

The importance of clarifying the expectations and goals for a mentoring program was mentioned in the majority of the interviews and is therefore included as a category. This main category is divided into three subcategories: communicating the goal and expectations, follow-up, and feedback.

Communicating the Goal and Expectations

The respondents highlighted the importance of having a clear goal and being specific about the outcomes of the mentoring program. One of the mentees in IDUN, R2, expressed that she felt that the goal of the mentoring program was unclear and not in compliance with what the mentees expected from the program.

R2: "I think perhaps that the goal sometimes wasn't very clear... That maybe it seemed like the project had some goals that did not correspond with all of the groups' goal"

Additionally, communicating the organizers' and participants' expectations is important to have a common understanding of the purpose of the mentoring program. Two of the organizers of Ada_veileder, R3 and R7, said that the only thing the organizers demand from the pairs is that they meet three times during the semester. However, it is up to the pairs how they want to spend the meetings. R3 mentioned that the pairs were provided with question cards that could work as icebreakers in the beginning. R7 said that they create a detailed document about the expectations of the program, which is revised each year based on feedback, and is sent out to the participants in e-mails as well as provided in the program's application form. R3 mentioned that it is important how the information is communicated and it is important to find a balance between asking too much and too little.

R3: "The most important is how you communicate it [the mentoring program] to both the students and mentors. A bit like what are the expectations when you come in [to the program] at all, and this is this very challenging... You need to write as much as possible in a way. Get as much information as possible because there will always be someone who misunderstands. Always someone who doesn't read everything and doesn't catch all the details... However, it's the balance between not writing too much because [people] won't bother reading it, but if you don't write enough, [people] won't understand it either."

According to R7, the organizers must decide whether the program should be low-threshold and whether the purpose is to discuss personal challenges or be a place where the participants can focus on work. If this information is not conveyed well enough and misunderstandings occur, the mentees can lose motivation and the mentors can feel like they are wasting time. R7 further said that it is important that the mentors know that they might not get a student who is ready for an academic discussion.

The participants' expectations must also be conveyed. A mentee in Ada_veileder, R11, mentioned that it was good that the mentors are asked to have an expectation clarification. Several mentors and mentees in Ada_veileder mentioned that they were satisfied with the facilitation and framework of the program. One of the mentees, R4, said that it would be nice to have more suggestions on what to talk about with the mentor. However, she also appreciated that the program was tailored to what the student was curious about and what was relevant for the student.

R11: "I think it was nice that they [the organizers] had set such a: Ada_ requires that you [the mentoring pairs] have three meetings. And the fact that they set such clear frames around it is very nice. And I don't know if it was my mentor or if

she was asked to do it, but an expectation clarification. Very good. What type of support are you looking for? What do you expect to gain from this?"

R10: "For us, it has worked well that they [the organizers] are like: okay, these are the expectations."

One of the mentees in IDUN, R6, highlighted the importance of having a common understanding of the program, and that she and the mentor had different expectations for the program. Another mentee in IDUN, R9, said that something went wrong during the expectation clarification process, which resulted in the mentor wanting to take part in the mentee's research. However, this was not what the mentee needed from the program. R2, a third mentee in IDUN, said that everything does not have to lead to a research product and their group could have saved a lot of time if they did not try to find a research topic that was relevant to all the participants in the group.

R9: "Something went wrong from the beginning in the expectation clarification... A mentor should not be involved in my research. That is not what I want. That is not what I need."

Follow-up

Follow-up is another concept that was mentioned during the interviews. R4, a mentee in Ada_veileder said that following up with the mentors can be useful in case the relationship between the mentor and mentee does not work out.

R4: "Have some follow-up with the mentoring pairs to make sure that no one gets... If it doesn't work out that well between a mentor and a student. Maybe some follow-up would help."

Feedback

According to one of the organizers in Ada_veileder, R7, a program like this is constantly evolving. Another organizer, R3, adds that such mentoring programs always have the potential to be improved. They send out an anonymous feedback form after each joint event, as well as one at the end of the program to get insight into the participants' experiences. R7 also mentioned that they allow the pairs to send feedback together to create more discussion around the questions which can give the organizers more insight into their experiences.

R7: "I can add that in a way, a mentoring program like this always has the potential to improve... We have had it [Ada_veileder] for a couple of years now and what we have now is very different from how we started it a couple of years back... Because the industry and the students change from year to year, one must

adapt the things that are here today and not get too caught up in: this is how they did it before. Of course, you use things that went well and that you feel can contribute even more. But that you always evaluate the program. How can the program be even better? That you think about that."

5.1.2 Matching

Matching was a frequently mentioned topic in the interviews. This chapter will first present what the participants said about having an application process. Then, four qualities to consider when matching the participants are explained: location, experience, field of study, and gender.

Application Process

According to R3, one of the organizers of Ada_veileder, they match the mentors and mentees so the participants can get more out of the program. They have an application process to get information about the participants to use in the matching process. R3 explained that the application process has changed since the first time the program was offered. At that time, the process was shorter, and they mainly asked if people were interested in participating, as well as their study program and interests. This resulted in more students than mentors signing up for the program, and some students not replying when they were assigned a mentor. However, Ada_ changed their application to include a motivational letter to increase the threshold to assure that those who sign up are committed. R3 further said that there must be a balance in the application process and that Ada_ could potentially match the participants better if they knew more about them. However, it might be scary to join if the application process is too comprehensive. Lastly, R3 highlights that it is not possible to get a perfect match between the participants, so the organizers must think about how much they should get caught up in the details during the matching. They do not get much information about how the person is from the application process, and therefore, the pairs might end up not having a good connection.

R3: "It's a bit... like what I say about the balance between it being too easy and not scary to sign up, but you actually have to be committed when you sign up so you actually join. But we saw that many students signed up for the first [iteration] but not that many in the second [iteration]. So we were a bit like: is it because it's autumn/spring? Is it because we in a way made it more challenging to actually write an application?"

One of the mentees in Ada_veileder, R4, said that it is advantageous to have an elaborated application process because only the people who are interested in having a mentor will join, as well as the organizers can match the participants better. However, R4 adds that the people who might need the mentoring program the most might not apply because of the elaborated application process. A mentee

in IDUN, R9, also expressed that matching the participants would be beneficial for the mentoring. She mentioned that the mentors and mentees could send in their interests and a motivational letter for the organizers to connect people who potentially can help each other.

R4: "Actually, I think it's best that it's a bit more. That you elaborate a bit more. Because then you might get the ones that are the most interested in having a mentor because then you actually have to put a job into applying. Not just tick off for "yes". But one can wonder who needs this the most. If maybe the ones that need it the most won't do it [apply for the mentoring program]. But I think you get a lot back from putting a bit more into the application process by knowing more about the student and being able to match better with a mentor. So I think it's best to have a bit more detailed application process."

Location

The participants did not agree on whether they should be matched based on their location. On one hand, a mentor in Ada_veileder, R12, which was based in the same city as the mentee, highlighted the importance of matching the participants based on their location to be able to meet in person and not remotely. On the other hand, two mentees in IDUN, R2 and R5, which had mentors working in universities in other countries appreciated the fact that they were not matched with a mentor from their own university. R5 mentioned that it was useful to have a mentor who was not from Norway because they could give a perspective from another country. Further, R2 mentioned that it was intentional to use mentors from other universities than NTNU because the mentors may not have other incentives when mentoring, such as mentors from NTNU could have. She also added that it was a networking aspect with using mentors from other universities.

R2: "It was also the intention, you know, with having a mentor that was in another university... I think it was what I said that they don't. They don't have the same intensive for you to finish, or it's also about networking I think. I remember that there was a point in that. That the professor was from another university."

Experience

Two mentees in Ada_veileder, R4 and R11, reflected on the most efficient way to match the participants based on where the mentee is in the course of the study. R4 said that the mentor should be adapted to where the student is in the study program. Near the end of the degree, it is more valuable with a mentor from the industry. However, in the first years of the study program, it could have been more suitable to have another student as a mentor. Similarly, R11 said that a student might need more practical guidance in the last year of their degree. While a younger student might need more emotional guidance.

R4: "In the first years, it wasn't [about] the working life. I didn't think that much about that in the beginning. It was more about the next years of the studies that was the main focus. But I remember that it was a mentoring program, but you were put together with a student that was a few years over and I think that was a good offer at that point. But later on, that [the mentor] becomes a person in the industry such as the mentoring program now [Ada_veileder]."

Field of Study

A mentee in IDUN, R1, said that whether matching is important depends on what the participants want to achieve with the mentoring program. Research was an important goal for many of the participants in IDUN. However, the mentoring group consisted of participants from different research areas. R8, a mentee in IDUN, said that she wanted to collaborate more with the other group members, but it was challenging because they worked on different topics. Similarly, R2, another mentee in IDUN, said that the group had planned to do research together, but they ended up not doing any because of their different research topics. She added that it is difficult to find one project that covers all the fields people work with, as well as it is challenging to have such collaborations simultaneously as writing a PhD.

R8: "I think it would be better if we as the group members in one mentor group could also collaborate more in means of research. I don't know if we should have planned this beforehand and you know reach out to people who are working on very similar topics. We tried to do that in IDUN but our topic was a bit generic and we ended up with many people working on different topics. So I think making people connect also in research and in more professional tasks would be nice for our group."

Additionally to fostering collaboration, matching participants in the field of study can also be beneficial for the mentee's motivation. An organizer in Ada_veileder, R7, said that they match the participants because it can be challenging for the students to find motivation if they do not meet people with the same academic background and interests as they have. R4, who participated as a mentee in Ada_veileder, wanted to work as a consultant after graduation and her mentor currently worked in consulting. She mentioned that she appreciated having a mentor who had been in the same situation as her. The mentor became a role model, and it was easier to accept the mentor's advice.

R4: "What I feel like has been the most important is that we have been quite similar to each other and yes a bit with what I said regarding the fact that she recently also graduated from the studies. Started to work as a consultant and therefore have had a lot in common in that sense... That you have been a bit through the same because then you become automatically more. It becomes a bit like a role model in a way. That you see someone that has been through something similar and it feels

a bit closer and that it's also easier to receive tips and [I] feel like it fits me more when it's very similar in that sense."

There are positive aspects of not being matched in the field of study as well. R10, a mentor in Ada_veileder pointed out that the student can get more perspectives if they are not matched on the field of study. A mentee in IDUN, R5, said she was not matched with her mentor based on their research topic. She highlighted that working with different research topics did not prevent them from talking about more generic things. Another mentee in IDUN, R6, stated that there are positive sides to having diverse groups, such as more opportunities to learn. However, it can be more complicated for the mentor to make the mentoring relevant and valuable.

R5: "The only limit was that she was not exactly on my topic of research but that was not a limitation for us to start talking because the problems that we were facing, that we were discussing were more generic. So it's not in my case that I was writing a scientific paper with her. This is why I'm saying that it depends on the needs of the person, the mentee. So in my case, it was not about writing papers and working for an academic per se... It was more about the career aspect because this is what I was needing. I needed at that time."

R6: "I think a diverse team is, might be better because if you have people from diverse background or from different levels, like a post-doc, PhD, a mix of many things. Then there are more opportunities to learn... So in this sense, it's good to have different people from different experiences in the same group so we can learn from each other. But then I think it's a bit more complicated for the mentor because if you have a level of same mentees like from the same experience or same background as mentees, then maybe it's easier for the mentor to design the materials and everything."

Gender

Whether it is valuable to be matched based on gender was also discussed in the interviews. A mentee in Ada_veileder, R11, highlighted the importance of identifying with the mentor, regardless of their gender. She further justified the statement by saying that the students can lose trust in the mentor if they struggle to identify with them. One of the mentees in IDUN, R9, said that she did not identify with her mentor because they were not in the same life situation. During the mentoring program, the mentee had two children, while the mentor did not have any, which made it challenging for the mentee to accept advice from the mentor because their values did not align. Another mentee in IDUN, R1, stated that you identify with the people you have things in common with, and therefore, girls might need to talk to other girls.

R9: "Then it can be useful to have a mentor that one can look up to... Then it

can be fortunate or it can be useful that there is someone who at least has either been in the situation or who can relate to the situation."

Another mentee in IDUN, R8, stated that connecting with the mentor is more important than their gender. However, she added that having a mentor of the same gender as the mentee might lead to more empathy and understanding of the mentee's life situation, and the mentee can be less comfortable talking about their private life with a male mentor. This assumption was also made by a mentee in Ada_veileder, R11, saying that although it is proactive with male mentors in a mentoring program for females, it might not work for everyone, because sometimes the mentees want to talk about problems related to girls in the technology field, which can be difficult for men to relate to.

R11: "It was also an aspect of him being the only male mentor in the program. [I] thought: that was cool. That is proactive... Personally, it [having a male mentor] would be fine, but I don't think it would have gone well for everyone... Because sometimes you have problems that are [related to] girls in tech."

When R6, a mentee in IDUN, was asked whether the gender of the mentor is important or not she answered that the mentor's interests are more important than their gender. Another mentee in IDUN, R9, agreed saying that the mentor's attitudes and perspectives are more relevant than whether the mentor is a man or a woman. One of the organizers in Ada_veileder, R7, said that male mentors are welcome to join the program because if there are men who want to join and feel like they have a lot to give to the mentees, they can do just as good a job as a female mentor. She further highlighted that not just women have to work for the inclusion of women.

R7: "We feel like if there are men that have a lot to give and that are engaged, it can be as good as women. That there is not just women that have a lot to give and not just women have to work for inclusion of women, but men also have to contribute to that."

5.1.3 Duration

During the interviews, the participants reflected on the program's duration and the number of meetings. This chapter will first present their thoughts regarding the length of the mentoring programs, followed by their perspectives on the frequency of meetings.

Length of the Program

According to one of the organizers of Ada_veileder, R3, the program used to last for only half a year. However, because they noticed a difference in the application

numbers for the fall and spring, they decided to run the program for a year. R4, one of the mentees in Ada_veileder expressed the benefits of the program lasting for a year. She said that last year she had questions regarding a job application process. Now that she has secured a job and has questions regarding the specific job, she appreciates that the mentor was involved in the application process.

R4: "[It's] actually pretty good [that the program lasts for a whole year] because again especially this regarding searching for jobs. It was very much like: this autumn I applied for different jobs and was more in the application process but now I have gotten a job and, yes then it's more questions regarding that specific job and then my mentor is [already] very involved in it and have followed, yes followed a bit along in that process and then it's easier to familiarize with the things I'm wondering about now I guess."

There was a disagreement among the mentees in IDUN about whether the mentoring program should last for a longer or shorter period than it did. R9 expressed that they did not have enough time with the mentor to get to know each other and build trust. R8 agrees that it can be hard to connect if the pairs do not have enough time together. However, she also expressed that it is important to find a balance between having a program that is too long and too short. She added that things can start to repeat themselves if the program lasts for too long, and there may be a limit to what you can learn from one mentor. She suggested that the mentee can get a new mentor when they feel like they have reached a point where they do not learn from their mentor anymore. R5 agreed with R8, saying that the group started to repeat themselves. She further expressed that it can be an idea to not have the same groups for a long period because the topics they talk about during the meetings can reach a point where there is nothing more to say. R1 observed that mentees from her group started to drop out of the mentoring program because they had more important things to do related to research and private life.

R8: "You know, things started to repeat itself after a while I think. So I think there's a balance between too short and too long, but I don't know what that balance is."

Another mentee in IDUN, R9, expressed the need for a more continuous effort. She stated that it is not sustainable to have an initiative that suddenly ends. By having a continuous mentoring program people have the opportunity to have a mentor whenever they need it. Not everyone needs a mentor all the time, but it can be beneficial to have it in periods. R3, one of the organizers in Ada_veileder, mentioned that they have not tried to offer a continuous mentoring program. However, she added that the pairs can decide for themselves if they still want to be in touch when the program has ended.

R9: One thing I think is a bit unfortunate is that it exists such programs and then it's over and then it's nothing. So I would actually rather [like] that the faculty has a focus on efforts that are continuous. Rather than having it like: now we have a program that we can push you through and then it's over... It's not a sustainable effort in that way because when the funding runs out, there is nothing left... Not huge costs to have something that recurs, rather than having a huge initiative: now we're going to lift everyone and we're going to get to know many more professors, and then it gets very quiet when the project is over."

Frequency of Meetings

When the participants were asked how often they met, R2, a mentee in IDUN, said that they had meetings lasting for 30 minutes every week. However, the high frequency of meetings led to people not prioritizing them. Therefore, R2 suggested that the groups could have had fewer, but longer meetings. R9, another mentee in IDUN, agreed, expressing that it was challenging to get things to add up with the mentoring program and other things in her schedule. Therefore, she suggested that a mentoring program should plan for more flexibility and not be too rigid. A mentor in Ada_veileder, R12, mentioned that not every student has an equal need for mentoring and some may want shorter meetings than others. Two of the mentees in Ada_veileder, R4 and R11, also mentioned that the mentor can give the mentee their contact information so the student can ask questions outside of the planned meetings.

R9: "And then there is this regarding flexibility. The program was structured to have many gatherings and it was a bit rigid. With good intentions, I see that. However, it's very challenging to make it add up and participate in everything. And it's not because you're not interested, but it's because you have to prioritize and have other things [going on]... The main reason I wanted to participate was to have an individual mentor, and then if you can have that, it's up to those two [the mentor and mentee] to find a time slot where they can talk with each other. So flexibility in that way, I think, will increase the chance that people will stay until the end."

5.1.4 Relationship Type

The subject of one-on-one and group mentoring was also brought up in the interviews. Respondents reflected on the positive and negative sides of each relationship type, along with joint events with all mentors and mentees and the option to change groups and mentors.

Benefits with One-on-One Mentoring

R12, one of the mentors in Ada_veileder, expressed that it was beneficial to only have one mentee because they could dedicate enough time to their mentee and did not have to feel bad for not being able to spend an equal amount of time with

several mentees. R11, a mentee in Ada_veileder, stated that a disadvantage of group mentoring is that all students may not feel like they are seen. She added that it can be easy for the mentor to start to listen to the student who opens up first, which excludes the students who do not speak the loudest. One of the organizers of Ada_veileder, R7, mentioned the same risk related to group mentoring. She highlighted the risk that students drop out of the program if introverted and extroverted students are placed in the same group.

R11: "If you put mentees together with different personality types. If you have someone who finds it very easy to open up and someone who struggles a bit with opening up. Then it's very easy for the mentor to just begin with the one that opens up right away... It becomes a bit of that "the one who shouts the loudest" situation without meaning to exclude the one who doesn't shout as loudly."

R9, a mentee in IDUN, mentioned another challenge that can arise from group mentoring. In her group, PhD candidates and associate professors were mentored together. This made it challenging to make the meetings valuable for all the mentees because the group was thematically diverse and the mentees had different needs. She added that the history between the colleagues also reduces the transparency in the group. Therefore, a suggestion is to create groups consisting of people who do not know each other in advance. The mentee also mentioned that the group did not have much focus on meta-communication, even though they were recommended to have it.

R9: "There was quite a bit of history, so the premises are already that one does not set up for full transparency... Things that have happened between colleagues that make it difficult... Then there might be a greater chance that it works when putting together people who don't work together. Who doesn't know each other beforehand... Where it's no ties beforehand."

A problem mentioned by several respondents is the lack of close relationships in group mentoring. R3, one of the organizers of Ada_veileder, expressed that Ada_ saw the need for the students to get a more personal relationship with a mentor. This allows the mentees to ask questions that can be challenging to ask in front of many people at an event, such as questions regarding salary, which a mentee in Ada_veileder, R11, mentioned that she asked. R8, a mentee in IDUN, said that the one-on-one meetings with the mentor were more intimate because they could talk about things they would not talk about in the group meetings. Another mentee in IDUN, R2, agreed, saying that it was more time and it felt more secure to talk about different topics. She added that there was more room to be vulnerable in the one-on-one meetings.

R2: "One perhaps gets a bit more time and a bit more security to air some things out. [You get] a bit more space to be vulnerable when it's one-on-one [mentoring]."

Lastly, some of the respondents expressed the benefits of the mentor having one-on-one meetings with several mentees. A mentor in Ada_veileder, R12, said that it would be possible for the mentors to have two mentees if they have the time, and a mentee in the program, R11, stated that this is a resource-efficient strategy. R10, another mentor in Ada_veileder, added that having several mentees can benefit the mentoring because they can ask questions they have received from one mentee to other mentees in case they wonder about the same things.

Benefits with Group Mentoring

Additionally, the respondents reflected on the positive sides of mentoring the mentees in a group. One of the mentors in Ada_veileder, R10, expressed that despite being less personal, group mentoring can be beneficial because students can take advantage of other students' questions. R7, one of the organizers in Ada_veileder, also reflected on the positive sides of group mentoring. She mentioned that it can be an advantage because more perspectives and themes can be brought up. R8, a mentee in IDUN, pointed out that the group meetings in IDUN were social and she considered it a positive aspect of the program to understand how the other mentees were doing. Another mentee in IDUN, R2, mentioned that a positive aspect of group mentoring is that the mentees can help other mentees in the group. Lastly, a third mentee in IDUN, R1, highlighted that time is a common challenge at NTNU and it is therefore necessary to mentor several mentees at a time.

R1: "A main problem at NTNU is, in a way, people's time, so the more one can, in a way, delegate and get people to support each other and process more [mentees] simultaneously, so to speak. Necessary."

In addition to reflecting on having several mentees in a group, the respondents reflected on the advantages of having several mentors per mentee. R10, a mentor in Ada_veileder, mentioned that it could be valuable for the students to have several mentors to get more perspectives and options. Another mentor in Ada_veileder, R12, said that each student could have one male and one female mentor to ask questions to. She added that the students would probably ask more questions to the female mentor. However, it can be less scary to enter a male-dominated industry if you have had a male mentor during your education.

R12: "It could perhaps have been both. That one [the mentee] had one male mentor and one female mentor as well... On each student [mentee], yes... It's to get a bit of two different perspectives, then. A bit of two different conversations. And maybe one can ask slightly different questions... It has something to do with safety, right. If you have a male mentor as well, it isn't that scary to enter a male-dominated industry... A bit of reassurance that men in the IT industry also work to get more women into the IT industry."

Joint Meetings and Events

During the interview, R3, an organizer in Ada_veileder, explained that the program has joint events in the mentoring program. She explained that it is a low-threshold event where all the groups meet and have dinner. During the dinner, they had someone come and talk about building relations and getting in touch with others in a work and educational context. Some of the participants also shared their experiences with the program during the dinner. One of the mentors, R10, expressed that this event was less formal because it was over a dinner that lasted for several hours. A suggestion from another mentor, R12, is to have a presentation of all mentors and mentees as a kick-off to create greater networks. They also had gatherings with all participants in IDUN. One of the mentees, R1, mentioned that IDUN had a workshop and mentor training across the mentoring groups. Another mentee, R5, stated that it would be beneficial to have more joint meetings and workshops across the groups. A third mentee in IDUN, R8, highlighted the importance of having these joint events to connect with other mentors and mentees.

R12: "It could also have been a kind of presentation of all who were mentors in the program and those who were students and maybe [it] could have been a common kind of kick-off. It could have been on [Microsoft] Teams, right. It wouldn't need to be in person... It would perhaps have been a bit more gain for us as mentors because then we would have had greater opportunities for networking."

One of the mentors in Ada_veileder, R10, suggested that the joint event could be at the beginning of the program because it is valuable for the pairs to start by meeting in person. However, R3, one of the organizers of the program explained that the reason they have the meeting in the middle or near the end of the program is because the participants do not have enough experiences to exchange in the beginning. She added that there might be too much to demand from the participants to join several of these events. However, R12, a mentor in Ada_veileder wished for more of these low-threshold events because one dinner does not necessarily fit everyone's schedule. The mentor generally wished for more opportunities for networking in the program. A suggestion from R4, one of the mentees in Ada_veileder, is to arrange meetings between two and two mentoring groups for the students to meet more mentors and other students. However, she added that the smaller the groups are, the easier it is to ask questions. R7, one of the organizers of Ada_veileder, also highlighted that connecting several pairs has a downside because if the mentors are people working in the industry, it can create competition between the mentors regarding recruiting students to their companies.

R7: "I imagine if you put several pairs together, it can quickly become, if one [mentee] has questions regarding the company or [how] the company operates, then it becomes a bit of competition between the mentors. What they bring out from their company. How they sell it."

Change Groups and Mentors

Whether or not the mentees should have the opportunity to change groups was a topic during the interviews. A mentee in IDUN, R5, expressed that it could be useful to join others' meetings to foster more collaboration. However, another mentee in IDUN, R8, mentioned that a downside of changing groups is that the groups follow different practices. Therefore, it can be difficult for a mentee to join new groups. The mentee further said that she would not like to change her mentor often because there is a special bond between a mentor and a mentee. R6, a third mentee in IDUN, mentioned that the groups would lack consistency if they changed regularly and consistency builds stronger relationships and trust. She added that it would be challenging for the mentor to plan tasks and collaborations if the groups always change.

R6: "Like, if your groups are always changing, then there is no consistency. That might be a[n] issue... Like if I'm a mentor, not a mentee, and I see my mentees are changing every month, then it's it would be hard for me to plan or plan any task or plan any collaboration... If you have consistency, then you have the opportunity to build stronger relations with your mentor and with your other mentees."

5.1.5 Delivery Method

Further, the participants reflected on the pros and cons of remote and in-person mentoring, which are presented in this chapter.

Benefits with Remote Mentoring

One of the organizers of Ada_veileder, R3, explained that most of the pairs meet remotely. However, a few pairs meet in person. She added that the majority of Ada_'s member companies are based in Oslo and they would therefore lose many potentially skilled mentors if they required the mentors to be in Trondheim and meet the mentee in person. One of the mentors, R10, agreed, saying that remote meetings lead to the fact that more people can participate in the program. She added that this is especially true now, given the tough times in the consulting industry, referring to the fact that consulting companies in Norway generally have poorer finances now than before.

R10: "The thing about having it [the mentoring program] digital is that many more can make themselves available, especially now that it's a bit tighter in the consulting industry, so I also think it lowers the threshold to join as a mentor [and] for a company to send people, in a way... because it's a bit tighter in the consulting industry, there are a bit smaller budgets and such... not everyone has equal opportunities to travel all the time... many want to continue [their career] in Oslo, so then it also makes it easier for people in Oslo to participate [in the mentoring program]."

The COVID-19 pandemic and the time aspect were other factors that were mentioned as beneficial with remote mentoring. Three of the mentees in IDUN mentioned the COVID-19 pandemic as one of the reasons the program was remote. Further, R1, a mentee in IDUN, stated that remote meetings take less time than in-person meetings. A mentee in Ada_veileder, R4, agreed saying that remote meetings are easier to fit in. R1 also added that a premise for remote mentoring to work well is that there are not too many participants in the group.

R1: "But as long as it's not more [people], that it's not too many at the same time. This [the mentoring program] was in groups, so it works quite well to do it remotely... Having it remote, also makes it take less time."

Benefits with In-Person Mentoring

A mentor in Ada_veileder, R12, stated that the conversation goes smoother when the participants can meet in person because they can do something else while they talk such as going for a walk, which results in a more personal connection. A mentee in the same program, R11, agreed saying that the most efficient meeting she had with her mentor was when they bought a coffee and went on a walk. She justified the statement by saying that not having to look the other person straight in the eyes and being able to concentrate on something else, creates a trustful situation where it is easy to open up. She compared it to parents taking their children for a ride in the car to make them talk. Another mentee in Ada_veileder, R4, mentioned that she had participated in two iterations of the program, where she had in-person meetings with her first mentor, but remote meetings with the second. She expressed that she and her first mentor were able to get to know each other in other areas than school and work when they met in person. However, she added that the joint events in Ada_veileder where all the groups gathered in person made it easier to get to know the mentor better, as well as building more confidence and trust in the mentor. Some of the mentees in IDUN agreed that the participants build a deeper connection when meeting in person. R8 said that the participants connect more when meeting in person and more topics and conversations may arise in more casual settings such as when going out for dinner. Further, R6 stated that meeting face-to-face builds more trust and will make communication stronger between the participants. Lastly, R2 said that one is more mentally present when meeting in person, which will build more trust within the group.

R11: "I actually think the meeting I got the absolute most out of was when we met, bought a coffee, and then we went for a pretty long walk... You know that: walk-or-drive theory where when it's two people who look forward and actually concentrate on doing something a bit different, it flows really well. It becomes a very like trustful situation and it's very easy to open up."

Further, R11 added that remote meetings are less engaging than in-person meet-

ings because the participants do not know if the other people are paying attention or if they are using their phones or working with something else. She expressed that it is easier to trust someone that you are sitting right in front of, which is also why she suggested having this interview in person. R2 also mentioned that it is easier to get distracted during remote meetings. She added that the meetings became something the mentees did not prioritize which maybe would be different if they were in-person.

R2: "Maybe it would have felt more like something one would prioritize then [if the meetings were in person]. Also, it's easy to get distracted or focus on something different if one has it [the meetings] digital, I think."

Hybrid Meetings

R6, a mentee in IDUN, highlighted that the meetings should be flexible, i.e. that it should be possible to meet in person and join remotely if they for example are away on a trip. On the other hand, R1, another mentee in IDUN, expressed that she was not satisfied when using a hybrid solution. They had tried a hybrid meeting but she experienced it as chaotic.

5.2 RQ2: What Considerations and Qualities Should Mentors Have When Mentoring Women in Computing Academia?

5.2.1 Mentor Qualities

This chapter highlights several qualities the respondents considered essential for mentoring women in computing academia: being a role model, taking initiative, showing interest and understanding, having relevant experience, and providing support. The respondents' opinions on mentor training are also presented in this chapter.

Role model

The term "role model" was mentioned in several interviews, and R8, a mentee in IDUN, highlighted that it is important to be exposed to role models. R3, one of the organizers in Ada_veileder, described a mentor as a role model and someone the mentee can look up to. She added that a mentor is someone who is not in the same situation as the mentee, but someone who has been there. Further, another organizer of the program, R7, said that by having such mentoring programs, the students get to see how it is to be a woman in the industry. R4, a mentee in Ada_veileder, expressed that it is inspiring to see people who have done the same thing they are trying to accomplish and that they become role models.

R4: "There are not a lot of people you meet... People that have been through the same as you feel... Who makes a good impression. [They] become sort of role models... Now I'm going to finish my master's. [And go] out in the industry, so talking to someone who has done it and who I feel has solved it in a good way is actually inspiring."

Initiative

R12, who participated as a mentor in Ada_veileder, characterized a mentor as someone who shares a lot of themselves and talks about things the mentee may be curious about even before the mentee knows they are curious about it. The respondent further said that the mentor's job is to open up for questions and conversation topics because it can be challenging for the mentee to know which questions to ask. Another mentor in Ada_veileder, R10, agreed saying that the mentor should come up with things to talk about without the student asking because it can be challenging for the student to know what they are curious about.

R12: "[A mentor] is maybe a person who talks about things one [the mentee] is curious about before one [the mentee] knows they're curious about it...[The mentor] shares a lot of themselves."

One of the organizers of Ada_veileder, R3, stated that the mentor should share their own experiences. Additionally, several respondents expressed that honesty is an important characteristic of a mentor. A mentee in IDUN, R5, highlights the importance of the mentor sharing good and bad experiences and that the mentor does not give the impression of a perfect human being. R5 further adds that the mentor should express that they are open to improvements, and admit it when they are not a suitable mentor for the mentee. R10 also highlighted honesty as an important quality for a mentor. She said that a mentor should share advice and life experience, as well as be honest and not just say what is politically correct.

R5: "The first thing that I also follow is honesty. So a person who is able and wants to share their experiences even if it was bad or good... Not many people share the bad experiences... So I think that people who are gonna be mentors, they should be able to say about their mistakes and their struggles... So not give the impression of a perfect human being that has everything right but there is room for improvement and be able to admit and share honest experiences. And also admit where is not her or his strength into mentoring someone because we don't want to receive some fake advise on something."

In addition to sharing their own experiences and being honest, R7, one of the organizers of Ada_veileder, stated that they want the mentors to take a lot of initiative and be the first to reach out to the mentee. Additionally, R3 mentioned that the mentor should be welcoming. One of the mentors in Ada_veileder, R10, reflected on the fact that it can be scary for the students to talk to people from

the industry and it is therefore important that the mentor is engaged and can lead the conversation.

R7: "[Here] we recommend in a way to push the mentor a bit to contact first because it can be scary for the student to do it... We send out a joint mail to both [the mentor and mentee], but then we write in the mail that we challenge the mentor to make contact as soon as possible in a way."

Availability was another term that was mentioned during the interviews. R3 pointed out that the mentor should be available. Additionally, R9, a mentee in IDUN, said that it is important that the mentor has the time needed to be a mentor.

Interest

Interest and motivation for gender-related work and being a mentor were other qualities that proved to be important during the interviews. R6, a mentee in IDUN, mentioned that a mentor should appreciate the idea of such mentoring programs and be interested in the topic. Further, two other mentees in IDUN, R8 and R9, said that it is necessary to involve people who are interested and motivated to be mentors.

R6: "I think when you choose the mentor, especially if you want to do something for girls, I think the mentor should be someone who really appreciate this idea... So choose mentors who are really interested in this topic. In this area of work or really want to contribute..."

Experience

Experience is another quality mentioned in several interviews. R3, one of the organizers of Ada_veileder, explained that the mentors should have worked in the industry for a few years before becoming mentors. R8, a mentee in IDUN, also highlighted the importance of having experienced mentors. One of the mentees in Ada_veileder, R11, reflected on the different advantages mentors with various levels of experience have. She explained that experience is considered beneficial if the mentee needs help with something specific. This is because an experienced mentor has seen many cases and can therefore help the mentee based on their experience. However, a less experienced mentor has other strengths such as having the feelings related to being a student fresh in mind. This can be feelings related to frustration around assignments, writing a Master's Thesis, and entering a new life phase. Another mentee in Ada_veileder, R4, agreed saying that a mentor who graduated many years ago may not have assignment due dates and writing a Master's Thesis fresh in mind. However, they have more experience and other advice to give.

R11: "If you have been working for ten years, you've had the time to see a lot of cases, so when your mentee comes and asks: "I've experienced this and this", then you can recognize it and answer based on experiences. Whereas for me that has only worked for seven months... if someone comes to me with practical problems, there is a big chance that I've not experienced it and have to familiarize myself with the situation... but rather can have my strength in recognizing the feelings that my mentee has now because I've just had them myself. I recognize the feeling of, in a way, despair for assignments or writing [a] Master's [Thesis] or the uncertainty around entering a new phase in life or in a way already starting to miss the study days before they're over. Those feelings are really fresh in the memory for me and it's therefore easy to help with for example."

R7, one of the organizers of Ada_veileder, also highlighted the importance of professional development and exchange in the mentoring program. This became clear in the interview with one of the mentors in Ada_veilder, R10, where she expressed the need to have mentors who work with technology. She added that it is great to let the students know that they can work with things other than technology when they graduate. However, only having mentors from human resources in a mentoring program that aims to reduce the dropout rate among female technology students can give the impression that they should not work as software developers. She added that the mentees were surprised when she told them that she programmed daily.

R10: "I think at least that there should be some technologists as mentors because it seemed a bit like at the joint mentor meeting, someone asked what I was doing [for a living], [and] I said I was a developer, and they just: "Oh, so you write code every day?", and I just [answered]: "yes". And then they were like: "Oh, there aren't many that do that here". I just [answered]: "What?". So that surprised me a little. Even though it's nice to know that you can do other things, for example [work] more with recruiting even though you're in a tech study. It's good to know that you have more opportunities. However, I feel like it can give a bit of an effect that it's not fun to be a developer in a way. Especially if it becomes overrepresented the opposite way."

Understanding

A mentee in Ada_veileder, R11, stated that the mentor should be understanding regardless of how different the mentor's and mentee's viewpoints are. Additionally, she said that the mentor should be caring and show empathy. Being patient is another important quality for a mentor that was brought up during the interview with R1, one of the mentees in IDUN. Lastly, another mentee in IDUN, R8, stated that it is important that the mentor keeps the things the mentee says confidential.

R8: "Of course, some things I think should be confidential. So I think it wouldn't be good if my mentor was talking about me to... another person."

Supportive

In the interview with R2, a mentee from IDUN, the term supportive was brought up as an important quality to have as a mentor. She said that a mentor is someone who gives advice and support. R11, a mentee in Ada_veileder, mentioned that the mentee can exchange thoughts, ideas, tips, and advice with the mentor. Similarly, R3, one of the organizers of Ada_veileder, expressed that a mentor is someone the mentee can spar and discuss with. However, several of the mentees who were interviewed for the thesis highlighted that there is a difference between a supervisor and a mentor. This will be elaborated on in the next chapter (5.2.2). R9, one of the mentees in IDUN, expanded on this statement saying that a mentor should not tell their mentee what to do or show which directions to take. However, the mentor's job is to help the mentee reflect.

R9: "A mentor, in my opinion, is not someone who is telling you what to do, but who helps you to reflect on what you can do. What you should do. Without... showing the way."

A mentor in Ada_veileder, R12, also mentioned that the mentor should have the student build confidence. Similarly, R7, one of the organizers of Ada_veileder, said that the mentors should motivate the mentees because they might be scared to start a job.

Mentor Training

Mentor training was a topic that was brought up in several interviews. R12, a mentor in Ada_veileder, expressed that the mentors could have used mentor training to remind them that they are mentors to help a person and not just to recruit students to their own company. Another mentor in Ada_veileder, R10, agreed saying that the mentors could have had mentor training from previous mentors to get insight into what they think is smart to share and think about when mentoring. However, when one of the organizers of Ada_veileder, R3, was asked if they provide mentor training, she answered that they have discussed it, but they have concluded to not offer it to the mentors. The reason is that many companies already have a lot of focus on mentor training in advance of these projects, as well as the organizers do not want to give the mentors too many guidelines on what to do.

R12: "What you said about mentor training isn't a bad idea because some might do it [be a mentor] more to promote their own company and recruitment. So it [mentor training] could perhaps also be a little prep[aration] for those who are becoming mentors, like a reminder that now you are a mentor for someone, so you should actually put on another hat than that work hat in a way."

5.2.2 Mentor's Benefits

Lastly, the respondents reflected on what the mentors gain from such programs. This chapter will present what the participants said regarding the recruitment of mentees to their own companies and the difference between being a mentor and a supervisor.

Recruitment for Own Company

According to a mentor in Ada_veileder, R12, they get to encourage more people to work with technology. One of the mentees in the program, R11, highlighted that there is a branding aspect for the mentors because the company they work for needs to create value beyond educating more female engineers. She added that the mentors wanted to get information from the students on how things are at the university, such as classes, collaborations with the industry, company presentations, and hiring patterns. One of the organizers of Ada_veileder, R3, brought up the same topic, saying that the mentors got information about what the students think of entering the industry, as well as the students' expectations and interests. Another organizer of the mentoring program, R7, added that the companies participating in the program want to recruit students and make themselves visible. R12 confirmed, saying that the mentoring program allows them to talk warmly about their own company.

R11: "Like now, when I sign up as a mentor, it's to give [the mentees] a good impression of the people working in my company. It's a branding aspect to it all... When you're [working in] a company that is paying to participate in such a program, you want to get something out of it. You have to create value beyond, of course, graduating more female engineers which is the most important."

According to R7, it is not a negative thing that the mentors want to recruit students to their companies. For example, R3 mentioned that some companies hired students from the program to work for them in the spring because some students told their mentors that they had a lot of spare time at the beginning of the spring semester. Even though the students can benefit from the mentors' incentive of wanting to recruit them, R7 highlighted that it is important to find a balance in how much the mentor should focus on recruitment. The companies must send representatives to be mentors who are motivated to participate and know what the program entails. R11 also said that it is advantageous that the mentor is honest about wanting to get something out of the program, and that it made her feel like she was helpful to the mentor as well.

R7: "It's about balance really... How hard [much] in a way they try to recruit compared to how much they actually give to the student and what the student needs. It does not necessarily have to be a bad thing if you [the mentee] in a way meet a company that you think is really cool and they want to recruit you. Then it's just good, so I don't see anything negative in that. But there are just things

we have been a bit careful with. That they [the companies] send mentors that are motivated in the program and know what the program is about."

Mentor versus Supervisor

R9, one of the mentees in IDUN mentioned that mentoring should give something back to both parties, not only the mentee. However, the mentor should not participate just to gain an advantage. She further expressed the importance of the mentor not having an interest in the mentee going a specific direction and not being dependent on how the mentee performs. Lastly, she mentioned that one should not collaborate with the mentor because having those interests can impact the trust in the relationship. The same topic was brought up in another interview with a mentee from IDUN, R2. She said that a mentor should not benefit from the relationship with the mentee the same way as others in academia, such as a supervisor. The mentee continued saying that the mentor should give the mentee advice because they want the best for the mentee. One can often feel that people, such as supervisors, have other incentives when giving feedback because it benefits them if the work is completed. Therefore, she highlighted that there is a difference between a supervisor and a mentor, and it is an advantage for the mentee to have a mentor who is not a part of their work. Another mentee in IDUN, R8, also mentioned that there is a difference between a mentor and a supervisor because the relationship with a supervisor is more professional, while one can talk about more personal things with a mentor. A third mentee in IDUN, R6, also stated the same difference. She explained that her mentor expected research collaboration, while the mentee expected something different.

R2: "But it's something else to be able to have someone who just gives [you] advice because they want you the best, and I think there is a lack in that general in life... A supervisor will often have an incentive for you to finish [your work]... I definitely think it's good to have [a] type of mentor that's on the outside [of my work]."

5.3 Learning Videos

A series of learning videos was created based on the themes extracted from the interviews and SLR: expectations, matching, duration, relationship types, delivery method, mentor qualities, and mentor's benefits. The slides of the frames for the first video explaining expectations are presented in table 5.3.1 to give the reader insight into the format of the videos. The six remaining videos had the same format in terms of color, table of contents, icons, and font. As mentioned in chapter 4, the video series was developed over two iterations. Two focus groups evaluated parts of the series in the first iteration. Thereafter, changes were made to the videos based on the feedback. Lastly, one focus group evaluated parts of the improved video series in the second iteration. Chapter 5.3.1 and 5.3.2 present the feedback from the first and second iteration respectively.

5.3.1 First Iteration

The two focus groups in the first iteration were presented with the first and third videos in the video series, explaining the expectations and duration of a mentoring program respectively. Background music was only added in the first video, for the participants to compare and give feedback on what they preferred.

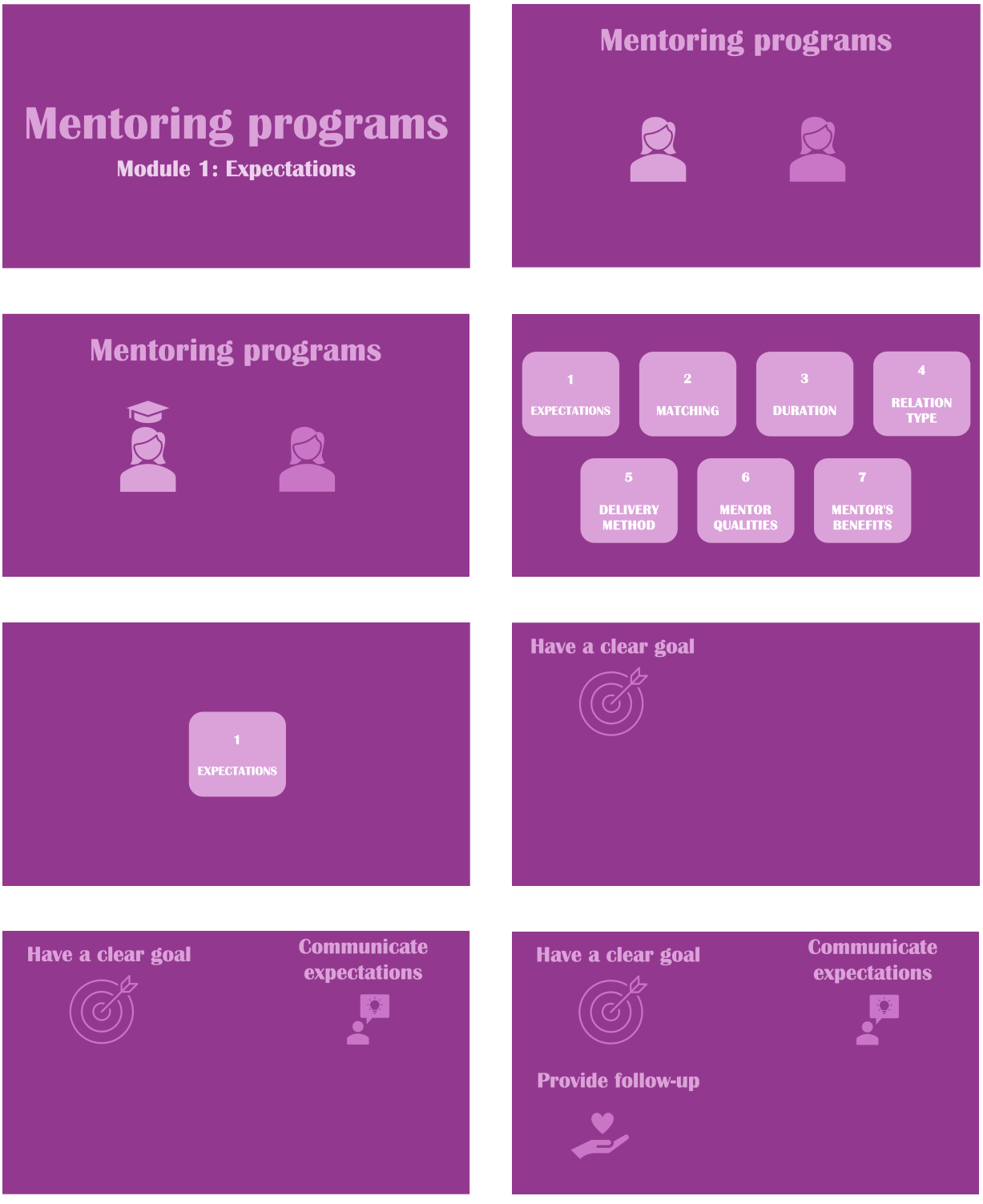


Table 5.3.1: Slides from the first iteration of the video about expectations

Positive Feedback on Content

The participants in the focus groups generally liked the content of the videos. After they were presented with the video about expectations, one of the participants commented that the video presented good points that they agreed with.

Another participant mentioned that the video presented realistic tips that are easy to implement in a mentoring program.

Further, the participants expressed that they liked the structure of the videos. They especially pointed out that they appreciated the overview of the contents of the video series presented at the beginning of the videos, as well as the hint for the next video at the end.

They also liked that the videos were short and concise. After watching the first video, the participants expressed that the video was easy to understand and that the video did not present too much and too complicated information. Additionally, they said that the video had a suitable length, that the message of the video was clearly conveyed, and that it was good points summarized in a short amount of time. After watching the second video, the participants commented that it was an advantage that the video used simple language, that it presented a suitable amount of information, and that it was easy to follow.

Positive Feedback on Format

As previously mentioned, only the video about expectations had background music for the participants to compare and give feedback on whether or not they preferred the background music. Several participants commented that they the music and that it made the video more engaging. One of the participants said that the music created a better atmosphere and that the video felt more serious and heavy without it.

The participants also expressed that there was a good ratio between figures and text and that the format made the videos more engaging to watch. Further, several participants mentioned that they enjoyed the use of icons and animations. Some also expressed that they liked the colors used in the videos and the consistent design.

Constructive Criticism on Content

A need for subtitles was mentioned by several of the participants. However, they suggested that adding subtitles should be optional for the viewer. They also mentioned that there should be references to the data used in the videos, such as the papers used in the SLR. Some participants in the first focus group suggested that the video series could include an introduction video explaining the video series and introducing the researcher and Master's Thesis. They also added that it could be nice to add a picture of the researcher. However, the second focus group argued that the viewers do not need information about the researcher and Master's Thesis. Another suggestion was to have the links to the papers in the video description when it is posted on YouTube.

Some participants commented that the first video should include more practical

examples. After watching the second video, it was mentioned that the introduction at the beginning of the videos should only be present in the first video. One of the participants also suggested including a concrete answer to how long a long-term mentoring program is, and how many meetings are optimal.

Constructive Criticism on Format

A repeating comment among the participants was to record the sound on the videos again. They explained that there was background noise, the pace was too fast, and there should be more natural pauses. Additionally, several participants commented that there was a lot of information at once and there could be more text on each slide. A suggestion was to have a whole slide for each main point and a summary of the points at the end.

One participant also stated that there does not only have to be pink colors because the video is about mentoring programs for girls. They suggested that each video could have its own color theme. One participant recommended using the same color palette, but including more nuances to create more depth in the video. It was suggested to add another color around the edges of the frame and use more contrasts.

Other comments were to let the music play longer after the video ends and to add the text "Mentor" and "Mentee" over the icons of the mentor and mentee in the second and third slides shown in table 5.3.1. Further, after watching the second video, a participant mentioned that it could be beneficial to keep the overall titles: "Length of the program" and "Frequency of meetings" while the points were described, in case the viewer forgets what the overall topic is. One participant also suggested to have more room at the top of the videos. In addition, it was suggested to show the "table of contents", shown in the fourth slide in table 5.3.1, longer in the video and to have arrows between the boxes to clearly show the order of the videos. Lastly, one participant suggested that there should generally be more variation in the videos.

5.3.2 Second Iteration

Several changes were made in the two videos based on the feedback from the focus groups. As shown in the pictures of the slides below, the same color palette is used. However, more contrasts and a darker color around the edges of the frame are added to give the video more depth. Regarding the video about expectations, the text "Mentor" and "Mentee" are added under the icons to make the slide more descriptive. This is shown in figure 5.3.1.

Figure 5.3.1: The text "Mentor" and "Mentee" are added

Several respondents commented that the videos explained a lot of information at once. Therefore, the four main points in the video about expectations: have a clear goal, communicate expectations, provide follow-up, and ask for feedback, get a full slide with several bullet points instead of only having the four headings in the same frame as in the previous solution. One of the slides showing the information regarding having a clear goal is shown in figure 5.3.2. This is to make it easier for the viewer to follow along. The points are summarized at the end as suggested by a respondent. This is shown in figure 5.3.3.

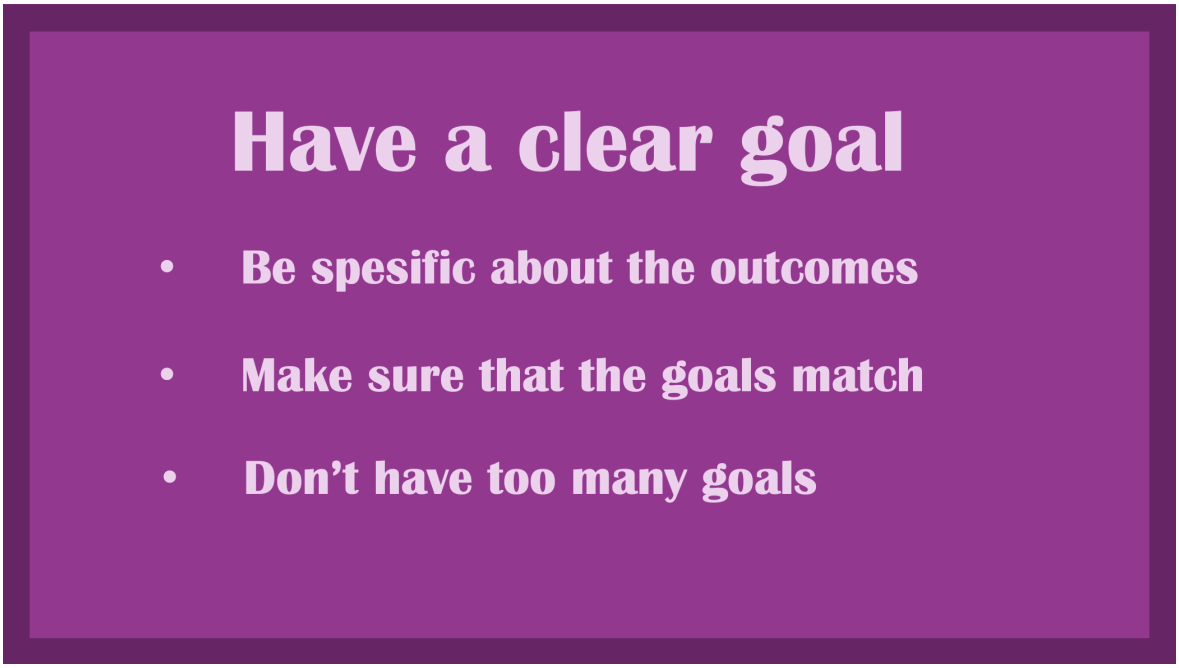


Figure 5.3.2: More text is added to the slides

Figure 5.3.3: The main points are summarized in one slide

Regarding the video about duration, the headings: length of the program, and frequency of meetings, were kept at the top of the slides when mentioning the associated points as shown in figure 5.3.5. Both of the headings were presented in the beginning to let the viewer know what topics will be discussed. This is shown in figure 5.3.4.

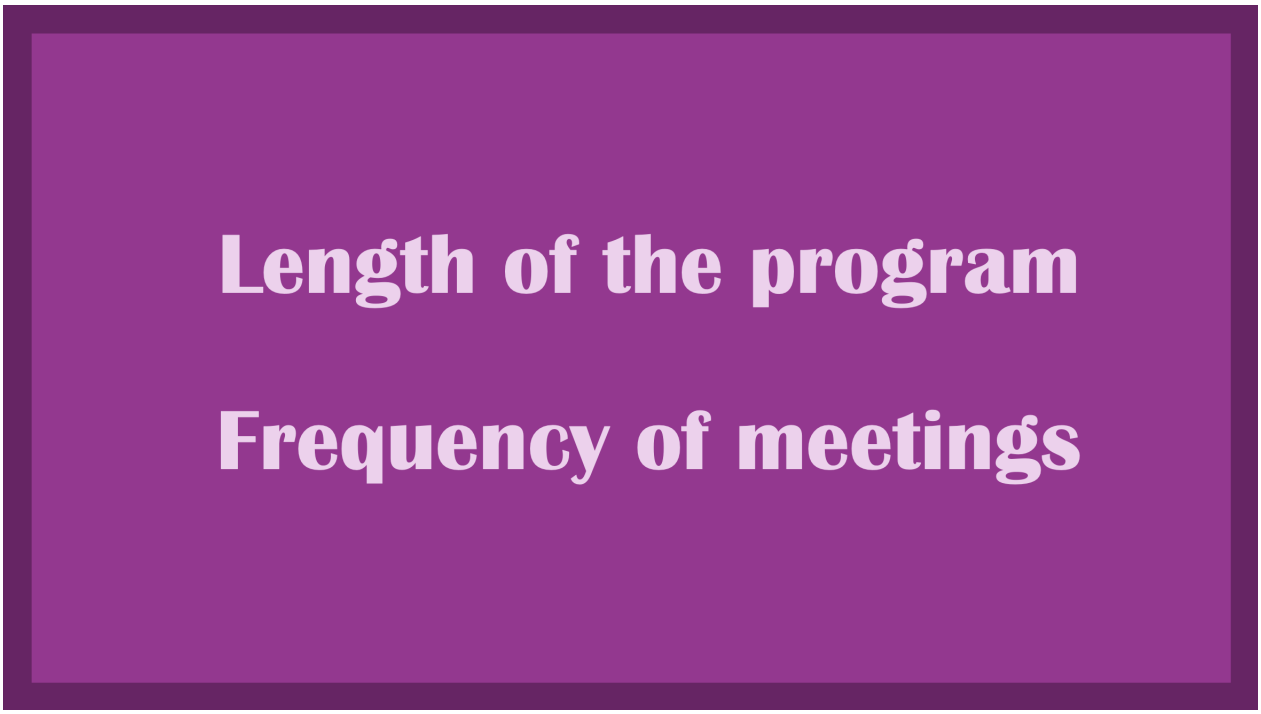


Figure 5.3.4: Both topics are presented at the beginning of the video

Similar to the video about expectations, more text was added to describe each point in the video about duration as shown in figure 5.3.5. The music was also added to this video based on the feedback.

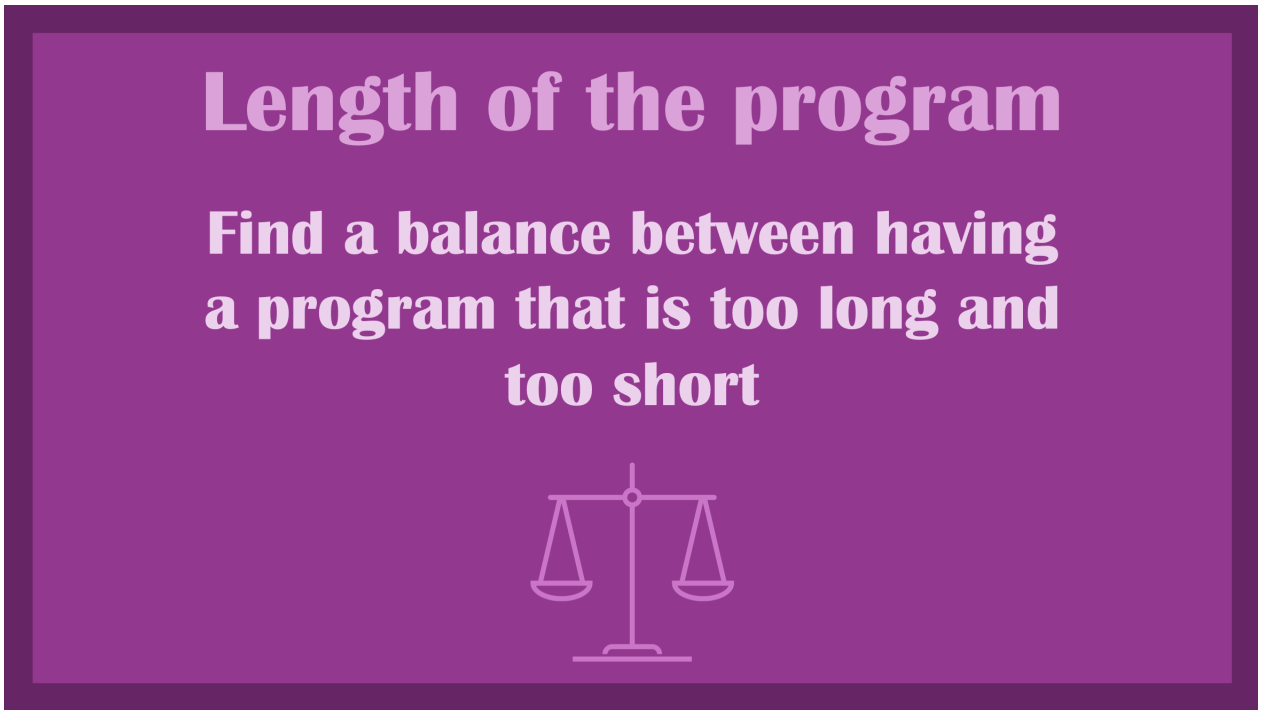


Figure 5.3.5: More text is added to the slides

The audio of the videos was re-recorded to improve the quality of the sound and to remove the background noise such as clicking on the trackpad. The talking was also improved to be slower and include more natural pauses. Lastly, the ending and music were extended to have a more natural ending. The feedback on the videos from the second iteration is presented below:

Positive Feedback on Content

The participants enjoyed that the videos presented short and concrete measures, which made them easy to follow. Additionally, several participants appreciated the overview of all seven videos at the beginning and end, as it made it easy to always know where you are in the series. One participant also mentioned that there was a good balance between the content on the slide and the information that was mentioned.

Positive Feedback on Format

The participants in the second focus group highlighted that the videos were engaging and had good energy, as well as not being boring to watch because of the voice and background music. Another participant mentioned that the videos were

formal, but not too formal. Further, it was said that the videos were aesthetically pleasing to watch, had good animations, and lasted for a suitable amount of time. Contrary to the feedback on the original videos, a participant in this focus group expressed that the improved videos had enough contrasts. After watching the video about duration, it was mentioned that icons associated with each point, shown in figure 5.3.5, made it easier to follow the video because it was something other than text to look at. Additionally, a participant said that they enjoyed that the video about duration had more time between each topic that was presented.

Constructive Criticism on Content

Due to time restrictions, no changes were made in the content from the first to the second iteration of the video. Therefore, this focus group commented on several of the same things regarding the content of the video as the groups from the first iteration. The group mentioned that the information in the video, and especially the video about duration, is too general, and they wanted more examples. Similarly to the previous groups, they wanted a more concrete answer to how long the program should last and how many meetings the program should involve. They suggested that data from the interviews could be used to include concrete examples in the videos. Another suggestion involved introducing a scenario, i.e. a mentoring program, in the first video, and using that program as an example through the video series.

This focus group also mentioned that it would be an advantage to mention that the data is collected through interviews and an SLR. However, they said that there is no need to elaborate more on the topic. They also suggested that the viewer should have access to the slides and the information that was mentioned in the video, as well as a more concrete step-by-step guide on how to create a mentoring program. Additionally, the viewer should have access to the research literature and links to websites that can expand more on the information given in the video, such as how to create good questionnaires.

Constructive Criticism on Format

Similar to the feedback from the first iteration, this group also mentioned that the videos should include subtitles considering accessibility. After receiving feedback in the first iteration regarding too much information at once and the need for more text, the author added more text on each slide as shown in figure 5.3.2. However, after watching the first video about expectations, the focus group in the second iteration said that the slides had too much text and that there should be more icons. They also mentioned that the slide summarising the points in the video about expectations, shown in figure 5.3.3 disappeared too fast. Other comments involved too fast pace, too loud background music, and a spelling error in the video about expectations where the author had written "to little" instead of "too little".

Due to time restrictions, the author did not make any changes based on the feedback from the second iteration of focus groups, except for lowering the background music's volume, adding the Women STEM UP and EU logo at the end, and correcting the spelling error. In addition, subtitles were automatically added when the videos were uploaded to YouTube.

CHAPTER

SIX

DISCUSSION

6.1 RQ1: What Factors Should Be Taken Into Account When Designing a Mentoring Program for Women in Computing Academia?

Differences Between Ada_veileder and IDUN

When reading this chapter, it is important to remember the differences between the two mentoring programs used in the study: Ada_veileder and IDUN. The former is one of many initiatives by Ada_ at NTNU that aims to create networks between female technology students and the industry, as well as provide them with enjoyment and motivation in their studies [41]. Ada_veileder consists of mentees who are students in the third to fifth year of their degree, mentored one-on-one by mentors from the industry. In this program, the student can get answers to the things they are curious about, for example regarding career, from a person with more experience. It is a continuous mentoring program, and there have been three iterations of the program, two lasting for one semester and one lasting for a year. Lastly, Ada_ is funded by their member companies and NTNU [40] and there are not many costs associated with their mentoring program because the mentors join the program through the company they work for which is a member company of Ada_. IDUN involved, among other initiatives, a temporary mentoring program lasting for three years with an external funding of 9.3 million NOK. The objective was to increase the number of females from PhD up to professor level in academia [43], through fostering networking opportunities and collaborations between the participants, as well as enhancing the mentees' research skills and motivation [42]. Therefore, mentees from PhD level to associate professor level were mentored in groups by professors from other universities [42].

Define and Communicate the Goal of the Mentoring Program

The theory presented in chapter 2.4 highlights the importance of defining the purpose and goals of the mentoring program before making any other decisions such as what qualities to match the participants on and the duration of the program [11]. Even though IDUN had a clear goal, namely to increase the proportion of women from PhD to professor at the IE faculty at NTNU, several mentees from the program mentioned in the interviews that there was a lack of alignment between the mentors' and mentees' expectations for the program.

This discrepancy may be because IDUN was built on several objectives: create a space where challenges, successes, and failures could be shared and foster networking and research collaboration between the mentors and mentees [42]. Based on the interviews of mentees in IDUN, it seemed like some mentees had a greater need for the first objective, i.e. having a space where they could share challenges and get support from a mentor. Whereas their mentor wanted to prioritize the latter, namely conducting research with their group. However, collaboration between an experienced and novice researcher on a particular task can remind one of a student-supervisor relationship, and according to several mentees in IDUN: there is a difference between a mentor and a supervisor. Mellon and Murdoch-Eaton state that mentoring is often separated from the roles of a supervisor to avoid conflicts related to work [65]. IDUN's goal to foster research collaboration among the participants may have created a role conflict for the mentor where they were to act as both a mentor and a supervisor for the mentee.

Strictness of Framework

Similar to defining the objectives of the program, Perez et al. state that it is important to establish a framework involving a timeline, expectations, and guidelines [11]. However, it is uncertain how detailed this framework should be. Perez et al. further express that the participants should decide when and how often to meet [11]. In Ada_veileder, the only requirement from the organizers was that the pairs should meet at least three times each semester. Additionally, the participants were invited to a dinner with all participants once per semester. In other words, the framework of Ada_veileder involved a timeline and a set of expectations for the participants. However, it was up to the pairs to decide the timing, frequency, agenda, and format, i.e. remote or in-person, of the mentoring. The advantage of a limited framework is that mentoring can be adjusted to the mentee's needs. However, the lack of guidelines can lead to the mentoring program becoming too informal, thus making it challenging for the mentees to approach and identify with the mentor [13]. One of the mentees in Ada_veileder expressed this uncertainly regarding how strict the guidelines should be. She mentioned that there could be more suggestions on what the pairs could discuss during the meetings. However, she appreciated that the mentoring was customized to the mentee's needs.

Matching on Field of Study

According to Perez et al. [11], mentors and mentees should be matched based on several factors, such as their goals, interests, desired duration of the program, personality, and areas of expertise. As discussed previously, there was not always alignment between the participants' goals in IDUN. While some mentors wanted to collaborate on research, some mentees needed personal support. Agreeing on a common goal is an important premise for the matching process because the matching must be based on the program's objective. According to one of the mentees in IDUN, R1, the importance of matching depends on what the participants want the program's outcome to be. That means that if the program aims to foster research collaboration between the mentor and mentee, the participants should be matched on their field of study. However, if the objective is to offer the mentee personal guidance, matching the participants on their personalities and interests might be more important. Based on IDUN's goal of research collaboration, matching the participants based on their field of study could have fostered more collaboration. One of the mentees expressed that she wanted to collaborate with the other participants, but it was challenging because the group members worked within different fields. Another mentee mentioned that although the group had planned to collaborate on research, they did not find a topic that was relevant to everyone, resulting in time being wasted. This could have been avoided if the participants were matched based on the program's goal. Another mentee in IDUN emphasized the importance of matching based on the goal. She needed more generic guidance, for example on her career, and she expressed that her and the mentor's different research topics were no limit for the mentoring she needed. However, according to a mentor in Ada_veileder, it is important to include mentors who work with technology. She highlights that, even though it is useful for the mentees to know that they can work in different fields after graduation, it can give the impression that they should not work with technology if the mentors are from other fields.

Matching on Location

The mentors' and mentees' location is another factor to take into account in the matching process, and the respondents reflected on both positive and negative aspects of being matched based on their location. Perez et al. state that a benefit of matching mentors and mentees from different universities is that the mentees feel like they can ask questions and share opinions without feeling like they are being evaluated [11]. Confidentiality is also easier to ensure when the participants do not regularly work together [11]. Another benefit of not matching the participants on location is that it allows for more participants to join [34], especially qualified mentors from other locations. On the other hand, an advantage of matching mentors and mentees on location is that the mentor can provide support relevant to the environment the mentee is in [11]. Additionally, the mentors and mentees can meet in person if they are matched on location, which tends to result in a greater sense of belonging [35]. The participants in Ada_veileder generally expressed that they preferred being matched on location to meet in person. However, the mentees in IDUN appreciated being matched with mentors from other universities because it fostered networking and gave the mentees new perspectives. One mentee

explained that it was intentional to use mentors from other universities because they would not have the same incentives as a mentor at NTNU could have. This corresponds with the theory regarding mentees feeling like they are being evaluated by mentors at their university [11].

The variations in the viewpoints regarding matching on location from the participants of IDUN and Ada_veileder may result from the differences in the target groups for mentors and mentees in the programs. As previously mentioned, in Ada_veileder, students in the third to fifth year of their degree were mentored by people from the industry. While in IDUN, mentees from PhD to associate professor level were mentored by professors [42]. Therefore, the mentees in IDUN may have been more concerned about being matched with a mentor from the same university, as they may have feared conflicts of interest if the mentors had incentives beyond mentoring. However, for the mentees in Ada_veileder, the risk of the mentor having other incentives is not dependent on whether the mentor is based in the same city as the mentee. This can explain why the mentees in IDUN saw the benefits of being matched with mentors from other universities, while the mentors and mentees in Ada_veileder focused more on the stronger connection the participants get from meeting in person.

Matching on Gender

There were also several viewpoints on whether the participants should be matched based on gender. According to Perez et al. [11], men and women tend to socialize differently, thus it can be valuable to match female mentees with female mentors. Rhodes et al. explain that women value interpersonal support and intimacy in helping relationships more than men [31]. Additionally, women offer and respond better to caring and social help than men, who tend to offer and respond better to more instrumental and heroic help [31]. However, S6 [48], one of the studies from the SLR, introduces results that do not align with the theories of Perez et al. and Rhode. In their study, Spieler states that the male mentors were more supportive when mentoring than the female mentors [48]. Therefore, Spieler highlighted that the degree the mentees participate does not depend on the gender of the mentor [48]. However, a limitation of this result is that the program involved both male and female mentees, thus the results may come from the male mentees. The results from the interviews reflect the theory. On one hand, mentees in both mentoring programs express that matching female mentees with female mentors may be more effective because it can foster more understanding and it tends to be easier for the mentee to talk about their problems. However, they highlight that the key priority is that the mentees connect and identify with their mentor. The respondents further expressed that having a mentor who wants to work towards gender balance in computing is more important than their gender. Additionally, it is proactive to use male mentors and it may be less concerning for women to enter a male-dominated field if they have experienced having a male mentor. This may be the reason why neither IDUN nor Ada_veileder were exclusively for women. IDUN involved male mentees and Ada_veileder involved male mentors. Only involving females in such a mentoring program can foster more understanding, transparency, and empathy. However, that may exclude potentially motivated male mentors and

the benefits having male mentors may yield. Based on the theory and interviews, one should consider not excluding male participants in such mentoring programs. However, it is important to ensure that they are motivated to participate and that their values align with the program's objective.

Duration and Frequency of Meetings

Another factor to consider when establishing a mentoring program is the program's duration and the frequency of meetings. As previously discussed, theory and interview data indicate that it should be up to the participants how often to meet [11]. R9 mentioned in the interview that it can be challenging to make things add up. Therefore, it is beneficial to facilitate a more flexible and not rigid mentoring program. Even though the frequency, length, and timing of the meetings should be up to the mentors and mentees, frequent contact is recommended. According to Bean et al., there is a correlation between frequent contact and a positive relation between the mentor and mentee [13]. Additionally, Ilumoka et al. state that a mentoring program must be long-term be be fully effective. Despite long-term being a vague term, it indicates that the program should last for longer than a few weeks or a couple of months. R9 suggested having continuous mentoring programs, without a specific end date, where the mentees can join in periods when they need mentoring. However, funding may be a limit for such long-lasting programs. IDUN's mentoring groups met about once a week for durations ranging from one to several years. According to the interview respondents, several mentees dropped out of the program despite having frequent contact with the mentor. Additionally, some mentees expressed that the content of the meetings started to become repetitive. The pairs in Ada_veileder on the other hand met less frequently. They were recommended to meet at least three times each semester, as well as participate in the dinner together with all pairs. R4 expressed that it was a suitable number of meetings each semester. However, it is important to highlight that the differences in the mentees' time schedules can be a reason why it was mentioned that mentees in IDUN decided to drop out, while not in Ada_veileder. The mentees in IDUN were PhD candidates, postdocs, or associate professors, who tend to have busier schedules involving teaching, supervising, and family life, compared to bachelor or master students like the mentees in Ada_veileder. Therefore, they may have had more reason to deprioritize the meetings.

Based on the discussion regarding the duration and frequency of meetings, a suggestion is to let the pairs or groups decide how often to meet and how long the meetings should last because the mentoring should be customized to the mentee's needs. However, it is recommended to meet once a month to facilitate regular connection and to avoid risking drop-out and repetition.

It is also worth highlighting that the relationship type can affect the frequency of meetings. A significant portion of the IDUN program was group meetings. Having group meetings means that there are more schedules to consider in the planning phase, which can limit the program's flexibility and ability to adapt to the mentees' needs. Whereas, because the participants in Ada_veileder met in pairs, it was only two schedules to consider.

Group vs. One-on-One Mentoring

Another reason some mentees in IDUN experienced a discrepancy in expectations may be the program's utilization of group mentoring instead of exclusively one-on-one mentoring. According to Perez et al. [11], the mentoring program must support mentees with different needs. However, R9 explained that the mentees in her mentoring group had different needs, making it challenging to make the mentoring valuable for all the participants. IDUN was built on the idea of adjusting the mentoring to the mentees' needs [42], but this can be hard to achieve in practice when there are many needs to consider. Group mentoring may have been an efficient strategy to foster networking, but not necessarily for creating a space to get personal support. On the other hand, one-on-one mentoring tends to create deeper and lasting relations between the mentors and mentees [33]. This aligns with the feedback from participants in Ada_veileder, saying that one-on-one mentoring gave the mentors the ability to dedicate enough time to the mentee without feeling bad for spending more time with some participants than others. In group mentoring programs when the mentor has several mentees, it can be natural for the mentor to start with the mentee who speaks the loudest. Participants from both programs also expressed that one-on-one meetings created a room for asking questions that they would not ask in a bigger group. However, whether to use one-on-one mentoring or group mentoring depends on the program's objective [32]. Group mentoring fosters more collaboration and networking, and is, therefore, more commonly used if the program's objective is skill development [33]. This is consistent with the interview respondents' comments, saying that mentees can help other mentees and take advantage of other questions when using group mentoring.

According to Perez et al. [11], all mentors and mentees should meet at the beginning of the program to foster networking, exchange of ideas, and to get an overview of the program. Both Ada_veileder and IDUN had such joint meetings and events with all participants. Ada_veileder had the event in the middle or near the end of the semester to let the participants gain some mentoring experiences that they could share with the others. However, some participants suggested having the event in the beginning for the pairs to start the program by meeting in person because several pairs usually met remotely. Some participants expressed that they generally wished for more of these events and networking opportunities. Therefore, it may be an idea to arrange frequent networking events in a mentoring program. However, a reason why Ada_ only arranges one joint event each semester could be that networking may not be the primary objective of Ada_veileder, as they have other events that foster networking.

Therefore, the suitable relationship type depends on the objective of the program. If the goal is to increase a specific skill, group mentoring may be most appropriate. While, if the program aims to be a space for personal support, one-on-one mentoring can be valuable. Nonetheless, there should be several networking opportunities during the program, especially in the beginning.

6.2 RQ2: What Considerations and Qualities Should Mentors Have When Mentoring Women in Computing Academia?

Mentors Having Other Incentives

As previously mentioned, facilitating research collaboration between the mentors and mentees in IDUN may have led to the mentees perceiving their mentor as a supervisor because they had incentives beyond supporting the mentees. Research highlights that a mentor will also benefit from participating in a mentoring program, such as gaining skills related to communication, leadership, planning, and decision-making [14]. Additionally, mentors become more committed to the university they mentor at and the other participants in the program [14]. This leads to the discussion on whether it is advantageous for the mentoring program that the mentor has incentives beyond simply supporting the mentee. R9 mentioned that a mentoring program must benefit both mentors and mentees. However, the question is what and to what extent the mentor should benefit from participating in the program.

Based on the interviews of mentors, mentees, and organizers of Ada_veileder, it seemed like recruiting students was a motivation for the mentors from Ada_'s member companies. R11 stated that there is a branding aspect for the mentors when participating in such programs because they need to create value for their company. Further, R7 mentioned that the companies want to make themselves visible to the students. However, it is important to emphasize that the recruiting aspect also benefits the mentees because it addresses a need the mentees have as well: getting employed. R11 explained how Ada_veileder helped her get in touch with a mentor who worked for a company she was interested in. Further, R7 described how some of the member companies hired students to intern for them in the spring because the students expressed that they had some spare time. Similarly, facilitating research collaboration between mentors and mentees in IDUN benefits both parties if they need more publications and research skills. However, it is not sufficient that the mentor's incentive fills one of the mentee's needs. It is also important that it does not come at the expense of the mentee's and the program's other objectives, such as providing the mentee with personal support.

None of the respondents from Ada_veileder expressed that the mentor's incentive of recruiting students got in the way of the mentoring. However, one of the organizers of the program, R7, mentioned that a risk of gathering multiple pairs is that it can foster competition between mentors from different companies. As previously mentioned, some mentees who participated in IDUN expressed that the program's objective regarding research collaboration did not match their needs. Therefore, it is important to get an understanding of the other parties' goals and needs and adjust the mentoring based on that. Honesty is an important premise to foster such understanding, and R11 explained how she appreciated that her mentor was honest about also wanting to gain something from the mentoring

program. Thus, the participants must find a balance between filling the mentor's and mentee's needs.

Mentors' Experience Level

Another discussion topic is the level of experience the mentor should have. Mentoring is commonly defined as a relationship where the mentor is more experienced than the mentee [11]. However, peers such as students and colleagues can also mentor each other based on their strengths [32]. In Ada_veileder, where students were mentored by mentors from the industry, the organizers required that the mentors had a few years of experience in the industry. While in IDUN, the mentees were mentored by professors, i.e. mentors with many years of experience in academia. Therefore, the experience level the mentors' should have depends on who the mentees are, as well as their needs and the objective of the mentoring program. According to Perez et al. [11], the mentee's needs may depend on their academic level. This aligns with responses from mentees in Ada_veileder. One mentee expressed that the mentor should be adapted to where the mentee is in the study program. A mentee who is almost finished with their studies may need support from a mentor in the industry. While for a first-year student, it may be more relevant with mentoring from another student. According to another mentee in Ada_veileder, there are also various benefits associated with the different experience levels. She stated that a mentor who has been in the industry for many years has experienced many situations and can therefore give support based on their experiences. However, a mentor who is newer to the industry may be able to relate more to the mentee's feelings. Therefore, the mentees and their needs are premisses for selecting the mentors and the appropriate level of experience.

6.3 Limitations

The disparities between Ada_veileder and IDUN pose a limitation in the study. The programs had different objectives, involved different participants, and had dissimilar funding. Therefore, it may be wrong to compare the programs, regardless of both of them being mentoring programs aiming to support women in academia. Further, only mentees from IDUN were interviewed in the study, whereas mentees, mentors, and organizers of Ada_veileder were interviewed. This may have caused bias in the results regarding IDUN because only one side of the story has been presented, while several perspectives from Ada_veileder are included. However, it is important to highlight that the study has not interviewed all participants from either of the programs. The results are therefore subjective and do not show the complete picture of either Ada_veileder or IDUN.

Another limitation of the research is that the participants of the focus groups who evaluated the learning videos were not necessarily the video series' target group. The videos are intended for mentors and those who want to establish mentoring programs for women in computing academia. These viewers are likely to have some domain knowledge of mentoring programs. Whereas, several of the participants in the focus groups were students without much domain knowledge,

which limited their ability to give feedback on the video content. Therefore, most of the feedback was related to the format of the videos. Further, the participants were only presented with two of the seven videos: expectations and duration, due to time restrictions. This limits the amount of feedback, as well as ignoring important aspects that should be improved in the remaining five videos.

6.4 Future Work on Learning Videos

A fictional mentoring program should be introduced at the beginning of the first video, which will be used to give practical and concrete examples throughout the video series. The examples should come from the data retrieved from the interviews and SLR. For example, the video regarding duration should involve that a mentoring program should last for longer than a few weeks or a couple of months, and the groups or pairs are recommended to meet about once a month.

The videos should be posted on the Women STEM UP website. Alongside the videos, a detailed step-by-step guide on how to create mentoring programs for women in computing academia, as well as links to the slides, research literature, and other relevant resources, should be provided. The YouTube description of the video series should include links to the Master's Thesis and the research literature. Additionally, it should provide information that the data is gathered from an SLR and semi-structured interviews of women who have participated in such mentoring programs at NTNU.

Regarding the format of the videos, more text should be added to each point in the five remaining videos, and there must be a better balance between text and icons. Lastly, more contrast colors should be added to the five remaining videos, or each video should be given a unique color theme to create more variation in the series.

CHAPTER

SEVEN

CONCLUSION

Chapter 5 and 6 emphasize the complexity of creating mentoring programs and the importance of making suitable decisions when establishing such programs, including the structure and choosing appropriate mentors. The Master's Thesis especially points out the necessity of defining the program's goal(s) and expectations before deciding on the rest of the structure, such as the matching process, whether to mentor the mentees alone or in a group, and which qualities the mentor should have. Additionally, it is essential to communicate the goal(s) and expectations to the mentors and mentees as clearly as possible to ensure that the participants have the same anticipations when joining the program. Further, the thesis emphasizes the importance of having a flexible structure and letting the participants decide on whether to meet in person or remotely and the duration and frequency of the meetings. However, it is recommended to establish some guidelines, such as encouraging regular contact, for example once a month. If the mentoring program aims to improve a particular skill, it may be efficient to introduce group mentoring with mentors who are specialized in the relevant field to assist the mentee. Whereas one-on-one mentoring with a mentor the mentee can identify with and trust may be more suitable if the objective is to provide the mentee with personal support. However, including mentors working in the computing field is recommended regardless of the program's objective. Lastly, men must also work towards gender diversity. They should therefore not be excluded from such programs, but the organizers must ensure that they are motivated to participate and that their values align with the values of the program.

It is essential that both the mentors and mentees benefit from the program. Despite the program's primary objective being to avoid drop-out among women in computing academia, participants may have additional goals and experience other benefits, such as networking, collaboration, and recruitment. However, these goals must not come at the expense of supporting the mentee with their needs. There must be a balance between achieving the program's primary goal and gaining additional advantages.

Further, mentoring programs are dependent on feedback from the mentors and mentees to improve. Therefore, iterative, permanent mentoring programs are considered sustainable and should be the universities' focus. However, this requires that universities budget for continuous efforts, such as NTNU does for Ada_, and not rely on grants, like IDUN was. By offering permanent mentoring programs for women at all levels of academia, universities can reach a critical mass of women in computing academia and eventually achieve gender diversity.

7.1 Future Works

For future research, more mentoring programs from other universities and countries should be studied to get a broader and more diverse perspective on the topic. Due to mentoring programs being a resource-intensive initiative that often requires funding, more research should be done on programs in the Global South. Further, the long-term effects of a program established using the video series should be compared to the impacts of previous initiatives.

REFERENCES

[1] T. C. Oppenhagen, "Understanding mentoring programs for increased diversity in computing: A systematic literature review," *Project report for the subject TDT4501 autumn 2023*, 2023.

[2] S. Altiner and M. Ayhan, "An approach for the determination and correlation of diversity and efficiency of software development teams," *South African Journal of Science*, vol. 114, Mar. 2018. DOI: 10.17159/sajs.2018/20170331.

[3] B. Trinkenreich, R. Britto, M. A. Gerosa, and I. Steinmacher, "An empirical investigation on the challenges faced by women in the software industry: A case study," Oct. 2022, pp. 24–35. DOI: 10.1145/3510458.3513018.

[4] Lovdata. "Lov om likestilling og forbud mot diskriminering (likestillings- og diskrimineringsloven)." (), [Online]. Available: https://lovdata.no/dokument/NL/lov/2017-06-16-51 (visited on 05/21/2024).

[5] UN. "Goal 5: Achieve gender equality and empower all women and girls." (), [Online]. Available: https://www.un.org/sustainabledevelopment/gender-equality/ (visited on 05/20/2024).

[6] J. Viola, "Belonging and global citizenship in a stem university," *Education Sciences*, vol. 11, p. 803, Dec. 2021. DOI: 10.3390/educsci11120803.

[7] G. Dost and L. Mazzoli Smith, "Understanding higher education students' sense of belonging: A qualitative meta-ethnographic analysis," *Journal of Further and Higher Education*, vol. 47, pp. 1–28, Mar. 2023. DOI: 10.1080/0309877X.2023.2191176.

[8] H. Holmegaard, L. Madsen, and K. Nielsen, "'you have to ask the right questions': A spatial analysis of the sense of belonging within higher education computer science," *European Journal of Engineering Education*, vol. 48, pp. 1–14, Sep. 2023. DOI: 10.1080/03043797.2023.2254289.

[9] Å. H. Larsen. "Flere tech-jenter må til for å finne morgendagens løsninger." (), [Online]. Available: https://www.digi.no/artikler/debatt-flere-tech-jenter-ma-til-for-a-finne-morgendagens-losninger/535073 (visited on 05/20/2024).

[10] J. D. Patón-Romero, S. Block, C. Ayala, and L. Jaccheri, "Gender equality in information technology processes: A systematic mapping study," in Mar. 2023, pp. 310–327. DOI: 10.1007/978-3-031-28073-3_22.

[11] M. P. D. Perez, K. Echihabi, M. Huisman, *et al.*, *Best practices from phd to professor: Career planning and mentoring*, Informatics Europe.

[12] M. I. S. Anazco and S. Zurn-Birkhimer, "Adapting to an unexpected hybrid campus: E-mentored femaleengineering students' intrinsic motivation, sense of belonging, and perception of campus climate," in *2022 CoNECD (Collaborative Network for Engineering & Computing Diversity)*, https://peer.asee.org/39100, New Orleans, Louisiana: ASEE Conferences, Feb. 2022.

[13] N. Bean, L. Lucas, and L. Hyers, "Mentoring in higher education should be the norm to assure success: Lessons learned from the faculty mentoring program, west chester university, 2008–2011," *Mentoring Tutoring*, vol. 22, Mar. 2014. DOI: 10.1080/13611267.2014.882606.

[14] A.-B. González-Rogado, A. García-Holgado, and F. García-Peñalvo, "Mentoring for future female engineers: Pilot at the higher polytechnic school of zamora," Sep. 2021, pp. 1–4. DOI: 10.1109/JICV53222.2021.9600410.

[15] W. S. UP. (), [Online]. Available: https://women-stem-up.eu/ (visited on 02/07/2024).

[16] NTNU. "About ntnu." (), [Online]. Available: https://www.ntnu.edu/about (visited on 05/05/2024).

[17] "Openoregon." (), [Online]. Available: https://openoregon.pressbooks.pub/socialprovisioning/chapter/the-importance-of-definitions/ (visited on 02/21/2024).

[18] J. Pryzgoda and J. Chrisler, "Definitions of gender and sex: The subtleties of meaning," *Sex Roles*, vol. 43, pp. 553–569, Oct. 2000. DOI: 10.1023/A:1007123617636.

[19] M. Company. "Mckinsey company." (), [Online]. Available: https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-diversity-equity-and-inclusion (visited on 02/22/2024).

[20] J. Dopmeijer, C. Schutgens, F. Kappe, *et al.*, "The role of performance pressure, loneliness and sense of belonging in predicting burnout symptoms in students in higher education," *PLOS ONE*, vol. 17, e0267175, Dec. 2022. DOI: 10.1371/journal.pone.0267175.

[21] S. Mcleod. "Simplypsychology." (), [Online]. Available: https://www.simplypsychology.org/maslow.html (visited on 02/14/2024).

[22] J. Blaney and J. Barrett, "Advancing gender equity and sense of belonging in computing: Are documented best practices representative of upward transfer students?" *Community College Journal of Research and Practice*, vol. 46, pp. 1–21, Mar. 2021. DOI: 10.1080/10668926.2021.1896396.

[23] M. Nielsen, S. Alegria, L. Borjeson, *et al.*, "Opinion: Gender diversity leads to better science," *Proceedings of the National Academy of Sciences*, vol. 114, pp. 1740–1742, Feb. 2017. DOI: 10.1073/pnas.1700616114.

[24] L. Kenney, P. McGee, and K. Bhatnagar, "Different, not deficient: The challenges women face in stem fields," *Journal of Technology, Management, and Applied Engineering*, vol. 28, Jun. 2012.

[25] UN. "Take action for the sustainable development goals." (), [Online]. Available: https://www.un.org/sustainabledevelopment/sustainable-development-goals/ (visited on 05/20/2024).

[26] B. Finzel, H. Deininger, and U. Schmid, "From beliefs to intention: Mentoring as an approach to motivate female high school students to enrol in computer science studies," May 2018, pp. 251–260, ISBN: 978-1-4503-5346-5. DOI: 10.1145/3196839.3196879.

[27] A. Shah, "What is mentoring?" *The American Statistician*, vol. 71, pp. 1–2, Jan. 2017. DOI: 10.1080/00031305.2016.1269686.

[28] J. Ramalho, "Mentoring in the workplace," *Industrial and Commercial Training*, vol. 46, pp. 177–181, May 2014. DOI: 10.1108/ICT-11-2013-0078.

[29] P. Single and C. Muller, "When email and mentoring unite: The implementation of a nationwide," Jan. 2001.

[30] A. Alhadlaq, A. Kharrufa, and P. Olivier, "Exploring e-mentoring: Co-designing un-platforming," *Behaviour Information Technology*, vol. 38, pp. 1–21, Jan. 2019. DOI: 10.1080/0144929X.2019.1571110.

[31] J. Rhodes, S. Lowe, L. Litchfield, and K. Walsh-Samp, "The role of gender in youth mentoring relationship formation and duration," *Journal of Vocational Behavior*, vol. 72, pp. 183–192, Apr. 2008. DOI: 10.1016/j.jvb.2007.09.005.

[32] R. Carruthers. "Mentoring groups vs 1-on-1: Which is better?" (), [Online]. Available: https://www.togetherplatform.com/blog/mentoring-groups-vs-traditional-mentoring (visited on 05/08/2024).

[33] T. T. C. Team. "Group mentoring 101: Workplace benefits and maximizing impact." (), [Online]. Available: https://www.tenthousandcoffees.com/blog/group-mentoring (visited on 05/20/2024).

[34] J. Reid, E. Smith, N. Iamsuk, and J. Miller, "Balancing the equation: Mentoring first-year female stem students at a regional university," vol. 24, pp. 18–30, Jan. 2016.

[35] J. Maluenda Albornoz, V. Infante Villagrán, C. Galve-González, G. Flores Oyarzo, and J. Berríos-Riquelme, "Early and dynamic socio-academic variables related to dropout intention: A predictive model made during the pandemic," *Sustainability*, vol. 14, p. 831, Jan. 2022. DOI: 10.3390/su14020831.

[36] NTNU. "Gender equality and diversity at ntnu." (), [Online]. Available: https://www.ntnu.edu/genderequality (visited on 05/05/2024).

[37] Abakus, "Utmatrikuleringsundersøkelsen 2023," Abakus, Tech. Rep., 2023.

[38] E. Tønnessen and H. Larsen. "Khrono." (), [Online]. Available: https://www.khrono.no/langt-faerre-studier-med-kjonnspoeng-fra-123-til-42/765543 (visited on 02/23/2024).

[39] S. Opptak. "Samordna opptak." (), [Online]. Available: https://www.samordnaopptak.no/info/opptak/opptak-uhg/poengberegning/legge-til-poeng/kjonnspoeng/ (visited on 02/23/2024).

[40] V. Lagesen, I. Pettersen, and L. Berg, "Inclusion of women to ict engineering – lessons learned," *European Journal of Engineering Education*, vol. 47, pp. 1–16, Oct. 2021. DOI: 10.1080/03043797.2021.1983774.

[41] NTNU. "Ntny." (), [Online]. Available: https://www.ntnu.no/ada (visited on 02/23/2024).

[42] L. Jaccheri, "Where are the female professors in stem?," Dec. 2022. DOI: 10.36227/techrxiv.21760532.v1.

[43] NTNU. "Ntnu." (), [Online]. Available: https://www.ntnu.edu/idun (visited on 02/23/2024).

[44] B. Kitchenham, "Procedures for performing systematic reviews," *Keele University Technical Report TR/SE-0401*, 2004.

[45] A. García-Holgado, S. Segarra, A.-B. González-Rogado, and F. García-Peñalvo, "Definition and implementation of w-stem mentoring network," Jan. 2023.

[46] M. Yang, B. Tiwari, R. Gautam, E. Ma, S. Zhang, and V. Muthukumar, "Engaging girls in learning engineering through building ubiquitous intelligent systems," Dec. 2022, pp. 208–213. DOI: 10.1109/TALE54877.2022.00041.

[47] M. Guenaga, A. Eguíluz, P. Garaizar, and A. Mimenza, "The impact of female role models leading a group mentoring program to promote stem vocations among young girls," *Sustainability*, vol. 14, p. 1420, Jan. 2022. DOI: 10.3390/su14031420.

[48] B. Spieler, J. Mikats, S. Valentin, L. Oates-Indruchova, and W. Slany, ""remotementor" evaluation of interactions between teenage girls, remote tutors, and coding activities in school lessons," in Jul. 2020, pp. 547–567, ISBN: 978-3-030-50512-7. DOI: 10.1007/978-3-030-50513-4_40.

[49] S. Wang, S. Andrei, O. Urbina, and D. Sisk, "A coding/programming academy for 6th-grade females to increase knowledge and interest in computer science," Oct. 2019, pp. 1–8. DOI: 10.1109/FIE43999.2019.9028578.

[50] S. A. Atwood, R. McCann, A. Armstrong, and B. S. Mattes, "Social enterprise model for a multi-institutional mentoring network for women in stem," in *2018 CoNECD - The Collaborative Network for Engineering and Computing Diversity Conference*, https://peer.asee.org/29575, Crystal City, Virginia: ASEE Conferences, Apr. 2018.

[51] M. Mclean, T. Susko, D. Harlow, and J. Bianchini, "Dancing robots: A collaboration between elementary school and university engineering students," Oct. 2017, pp. 1–4. DOI: 10.1145/3141798.3141817.

[52] A. Ilumoka, I. Milanović, and N. S. Grant, "An effective industry-based mentoring approach for the recruitment of women and minorities in engineering," *Journal of STEM Education: Innovations and Research*, vol. 18, pp. 13–19, 2017. [Online]. Available: https://api.semanticscholar.org/CorpusID:149244893.

[53] J. Clarke-Midura, V. Allan, and K. Close, "Investigating the role of being a mentor as a way of increasing interest in computer science," Mar. 2016. DOI: 10.1145/2839509.2844581.

[54] H. Stoeger, X. Duan, S. Schirner, T. Greindl, and A. Ziegler, "The effectiveness of a one-year online mentoring program for girls in stem," *Computers Education*, vol. 69, pp. 408–418, Nov. 2013. DOI: 10.1016/j.compedu.2013.07.032.

[55] R. Khare, E. Sahai, and I. Pramanick, "Remote mentoring young females in stem through magic," Apr. 2013.

[56] AI. "How can you use video and animation to enhance your content design?" (), [Online]. Available: https://www.linkedin.com/advice/3/how-can-you-use-video-animation-enhance-your-content-k4m4c (visited on 02/06/2024).

[57] J. Recker, *Scientific Research in Information Systems: A Beginner's Guide*. Jan. 2012.

[58] B. J. Oates, M. Griffiths, and R. McLean, *Researching Information Systems and Computing*. Feb. 2022.

[59] SIGSOFT. "Sigsoft." (), [Online]. Available: https://www2.sigsoft.org/ (visited on 05/02/2024).

[60] P. Ralph, S. Baltes, D. Bianculli, *et al.*, "Acm sigsoft empirical standards," Oct. 2020.

[61] Q. U. of Charlotte. "A guide to qualitative rigor in research." (), [Online]. Available: https://online.queens.edu/resources/article/guide-to-qualitative-rigor-in-research/ (visited on 02/12/2024).

[62] Uppbeat. "Free music for creators." (), [Online]. Available: https://uppbeat.io/ (visited on 05/28/2024).

[63] M. Azzajjad, M. Tendrita, and D. Ahmar, "Effect of animation and review video making (arvima) in non-classical learning model on independent learning and students' learning outcome," *Linguistics and Culture Review*, vol. 5, Nov. 2021. DOI: 10.21744/lingcure.v5nS3.1657.

[64] N. D. Puspaningtyas and M. Ulfa, "Improving students learning outcomes in blended learning through the use of animated video," *Kalamatika: Jurnal Pendidikan Matematika*, vol. 5, pp. 133–142, Nov. 2020. DOI: 10.22236/KALAMATIKA.vol5no2.2020pp133-142.

[65] A. Mellon and D. Murdoch-Eaton, "Supervisor or mentor: Is there a difference? implications for paediatric practice," *Archives of disease in childhood*, vol. 100, Apr. 2015. DOI: 10.1136/archdischild-2014-306834.

APPENDICES

APPENDIX

A

INTERVIEW GUIDES

Intervjuguide – Mentorprogrammer

Introduksjon

- Hva er målet med deres arbeid?
- Har dere hatt prosjekter der kvinnelige studenter veiledes, enten i gruppe eller på tomannshånd, av en mentor?
    - Hva var grunnen til at dere startet et slikt prosjekt?
    - Hvilke temaer ble diskutert/så dere for dere at skulle bli diskutert?
        - Praktiske/personlige

Deltagere

- Hvem var mentorer?
    - Hadde dere krav til egenskaper/kvaliteter ved mentoren?
    - Hvordan ble de rekruttert?
    - Ble de betalt?
- Hvordan rekrutterte dere studentene?
    - Hvordan ble programmet solgt inn?
- Ble deltagerne matchet?
    - På hvilken måte? Alder/kjønn/erfaring/samtaleemne/studieprogram
- Kunne deltagerne bytte mentor eller hadde de samme gjennom hele perioden?

Struktur

- Hvordan var møtene mellom mentoren og studenten? Forklar hvordan de ulike valgene ble tatt
    - Hvor ofte møttes de?
    - Bestemte de selv når de skulle møtes?
    - Møttes de i gruppe med flere studenter og mentorer, eller på tomannshånd?
    - Møttes de remote eller ansikt-til-ansikt?
- Hva ble gjort under møtene?
- Hvor lenge varte prosjektet/hvor mange møter hadde de?
- Ble mentorene kurset i forkant?
- Hva var viktig for mentorene å tenke på når de skulle veilede/inspirere/hjelpe studenter?

Tilbakemeldinger/resultater

- Hvilke tilbakemeldinger har dere fått fra studentene og mentorene?
- Har dere sett/målt resultater av mentorprogrammet?
- Hvis dere skulle organisert et slikt program igjen, hva ville dere gjort annerledes?

Avslutning

Figure A.0.1: First page of the interview guide for creators of mentoring programs

- Anser du et slikt tiltak som mer effektivt for å hindre at jenter dropper ut av teknologistudier enn andre tiltak? F.eks. presentasjoner, lunsjer med andre studenter, kurs
- For å oppsummere: hva tenker du er de viktigste tingene å tenke på når man lager et mentorprogram for kvinnelige teknologistudenter?
- Har du noe mer å tilføye?

Figure A.0.2: Second page of the interview guide for creators of mentoring programs

Intervjuguide – Mentorer/mentees

Innledning

- Hva forbinder du med ordet "mentor"?
- Har du noen du forbinder med mentorer i studie/jobb sammenheng?
- Hvilke problemer tror du er mer utbredt hos underrepresenterte grupper på studiet/i jobb, som f.eks. jenter/kvinner?
- Hvorfor valgte du å delta på mentorprogrammet?
- Hva var din helhetlige opplevelse av deltagelsen?

Struktur

- Hvordan ble du rekruttert til å delta?
- Ble du matchet med en mentor eller mentee?
- Kunne du bytte mentor/mentees i løpet av programmet eller var det likt gjennom hele perioden?
- Hvordan var møtene med mentor/mentee?
    - Hvor ofte møttes dere?
    - Bestemte dere selv når de skulle møtes?
    - Møttes dere i gruppe med flere mentees og mentorer, eller på tomannshånd?
    - Møttes dere remote eller ansikt-til-ansikt?
- Hva ble gjort under møtene?
    - Hvilke temaer snakket dere om?
    - Hva fikk du hjelp med?
- Hvor lenge varte prosjektet/hvor mange møter hadde dere til sammen?
- Til mentorer: ble du kurset i forkant av mentorprogrammet?

Tilbakemeldinger

- Hva syntes du at fungerte bra og mindre bra med mentorprogrammet?
    - Hva ville du endret/gjort annerledes?
- Til mentees: hva var bra og mindre bra med mentoren din?
    - Hva anser du som viktig å tenke på når man er en mentor for kvinner i IT?
- Utgjorde programmet en forskjell i din studie-/jobb-hverdag?

Avslutning

- Anser du et slikt tiltak som mer effektivt for å hindre at jenter dropper ut av teknologistudier enn andre tiltak? F.eks. presentasjoner, lunsjer med andre studenter, kurs
- For å oppsummere: hva tenker du er de viktigste tingene å tenke på når man lager et mentorprogram for kvinnelige teknologistudenter?
- Har du noe mer å tilføye?

Figure A.0.3: The interview guide for mentors and mentees

APPENDIX

B

SIKT APPLICATION - INTERVIEWS

Sikt

Meldeskjema

Referansenummer
577556

Hvilke personopplysninger skal du behandle?

- Navn
- Kontaktinformasjon
- Stemme på lydopptak
- Bakgrunnsopplysninger, som i kombinasjon vil kunne identifisere en person

Beskriv bakgrunnsopplysningene
Gender, country of residence, education/job, participation in mentoring program, and whether they were a mentor or mentee

Prosjektinformasjon

Tittel
How to Create a Mentoring Program for Female Computing Students

Sammendrag
This research aims to create guidelines on how to establish a mentoring program for female computing students, in order to retain more women in university computing study programs. Most mentoring programs and other initiatives for women in STEM are aimed towards high school students or students at a lower educational level, with the goal of making computing education more attractive for girls. However, few initiatives are taken to retain the women in computing study programs. The guidelines will involve how to structure a mentoring program, as well as how to mentor female students.

Begrunn behovet for å behandle personopplysningene
Audio recording is used to analyze and transcribe the interviews and to avoid taking notes during the interviews. Gender is important personal information to include in the study because the study focuses on the gender imbalance in computing study programs. Most participants will likely be women, but information about the gender is gathered if people of other genders are interviewed. Country of residence will be used to see patterns and differences in the answers from participants from different countries (if participants from several countries are included) Education/job will be used to describe the participant's experience level. It can also be used to see if there are any differences in the answers from participants from different levels (master students, PhD students, people from the industry etc.) Names will be used to separate the participants from each other when planning the interviews Contact information will be stored if I need to contact the participants after the interviews What mentoring program the participants have participated in and whether they were a mentor or mentee will be used to describe the participant

Ekstern finansiering
Ikke utfyllt
Type prosjekt
Master

Kontaktinformasjon, student
Tuva Cornelia Oppenhagen, tuvaco@stud.ntnu.no, tlf: 95830760

Behandlingsansvar

Behandlingsansvarlig institusjon
Norges teknisk-naturvitenskapelige universitet / Fakultet for informasjonsteknologi og elektroteknikk (IE) / Institutt for datateknologi og informatikk

Prosjektansvarlig
Letizia Jaccheri, letizia.jaccheri@ntnu.no, tlf: 91897028

Er behandlingsansvaret delt med flere institusjoner?
Nei

Utvalg 1

Beskriv utvalget
Females studying computing in university

Figure B.0.1: First page of the Sikt application for interviews

Beskriv hvordan du finner frem til eller kontakter utvalget
Recruitment from own network

Aldersgruppe
18 - 30

Inngår noen av disse gruppene i utvalget?
- Personer bosatt i land utenfor EU/EØS-området

Hvilke personopplysninger vil bli behandlet om utvalg {{i}}? 1
- Navn
- Kontaktinformasjon
- Stemme på lydopptak
- Bakgrunnsopplysninger, som i kombinasjon vil kunne identifisere en person

Hvordan innhentes opplysningene om utvalg 1?

Personlig intervju

Vedlegg

Interview guide - Students.pdf

Lovlig grunnlag for å behandle alminnelige personopplysninger
Samtykke (Personvernforordningen art. 6 nr. 1 bokstav a)

Informasjon til utvalg 1

Mottar utvalget informasjon om behandlingen av personopplysningene?
Ja

Hvordan mottar utvalget informasjon om behandlingen?
Skriftlig (papir eller elektronisk)

Informasjonsskriv

Students - Information letter.pdf

Utvalg 2

Beskriv utvalget
People who are working with or have created mentoring programs for women in computing study programs

Beskriv hvordan du finner frem til eller kontakter utvalget
Recruitment in own network, social media, internet

Aldersgruppe
18 - 100

Inngår noen av disse gruppene i utvalget?
- Personer bosatt i land utenfor EU/EØS-området

Hvilke personopplysninger vil bli behandlet om utvalg {{i}}? 2
- Stemme på lydopptak
- Bakgrunnsopplysninger, som i kombinasjon vil kunne identifisere en person

Hvordan innhentes opplysningene om utvalg 2?

Personlig intervju

Vedlegg

Intervjuguide - Mentorprogrammer.pdf

Lovlig grunnlag for å behandle alminnelige personopplysninger
Samtykke (Personvernforordningen art. 6 nr. 1 bokstav a)

Informasjon til utvalg 2

Mottar utvalget informasjon om behandlingen av personopplysningene?
Ja

Figure B.0.2: Second page of the Sikt application for interviews

Hvordan mottar utvalget informasjon om behandlingen?
Skriftlig (papir eller elektronisk)

Informasjonsskriv

Mentoring program - Information letter.pdf

Utvalg 3

Beskriv utvalget
People who have participated/are participating in mentoring programs (mentors and mentees)

Beskriv hvordan du finner frem til eller kontakter utvalget
From the internet and by asking people working with the mentoring program if they can put me in contact with the participants

Aldersgruppe
18 - 100

Inngår noen av disse gruppene i utvalget?
- Personer bosatt i land utenfor EU/EØS-området

Hvilke personopplysninger vil bli behandlet om utvalg {{i}}? 3
- Navn
- Kontaktinformasjon
- Stemme på lydopptak
- Bakgrunnsopplysninger, som i kombinasjon vil kunne identifisere en person

Hvordan innhentes opplysningene om utvalg 3?

Personlig intervju

Vedlegg

Intervjuguide – Mentorermentees.pdf

Lovlig grunnlag for å behandle alminnelige personopplysninger
Samtykke (Personvernforordningen art. 6 nr. 1 bokstav a)

Informasjon til utvalg 3

Mottar utvalget informasjon om behandlingen av personopplysningene?
Ja

Hvordan mottar utvalget informasjon om behandlingen?
Skriftlig (papir eller elektronisk)

Informasjonsskriv

Participants in mentoring programs - Information letter.pdf

Tredjepersoner

Innhenter prosjektet informasjon om tredjepersoner?
Nei

Dokumentasjon

Hvordan dokumenteres samtykkene?
- Manuelt (papir)
- Elektronisk (e-post, e-skjema, digital signatur)

Hvordan kan samtykket trekkes tilbake?
The participants can withdraw their consent by informing the researcher.

Hvordan kan de registrerte få innsyn, rettet eller slettet personopplysninger om seg selv?
The participants can get insight, change or remove personal data about themselves by informing the researcher.

Totalt antall registrerte i prosjektet
1-99

Figure B.0.3: Third page of the Sikt application for interviews

Tillatelser

Vil noen av de følgende godkjenninger eller tillatelser innhentes?
Ikke utfyllt

Sikkerhetstiltak

Vil personopplysningene lagres atskilt fra øvrige data?
Ja

Hvilke tekniske og fysiske tiltak sikrer personopplysningene?

- Adgangsbegrensning
- Fortløpende anonymisering
- Flerfaktorautentisering

Hvor blir personopplysningene behandlet?

- Private tjenester

Hvem har tilgang til personopplysningene?

- Student (studentprosjekt)
- Interne medarbeidere

Overføres personopplysninger til et tredjeland?
Nei

Avslutning

Prosjektperiode
01.02.2024 - 10.06.2024

Hva skjer med dataene ved prosjektslutt?
Data anonymiseres (sletter/omskriver personopplysningene)

Hvilke anonymiseringstiltak vil bli foretatt?

- Lyd- eller bildeopptak slettes
- Personidentifiserbare opplysninger fjernes, omskrives eller grovkategoriseres

Vil enkeltpersoner kunne gjenkjennes i publikasjon?
Nei

Tilleggsopplysninger

Figure B.0.4: Forth page of the Sikt application for interviews

APPENDIX

C

SIKT APPLICATION - FOCUS GROUPS

Sikt

Meldeskjema

Referansenummer
616096

Hvilke personopplysninger skal du behandle?

- Kontaktinformasjon

Prosjektinformasjon

Tittel
How to Create a Mentoring Program for Female Computing Students

Sammendrag
This research aims to create guidelines on how to establish a mentoring program for female computing students, in order to retain more women in university computing study programs. Most mentoring programs and other initiatives for women in STEM are aimed towards high school students or students at a lower educational level, with the goal of making computing education more attractive for girls. However, few initiatives are taken to retain the women in computing study programs. The guidelines will involve how to structure a mentoring program, as well as how to mentor female students.

Hva er formålet med behandlingen av personopplysninger?
Jeg skal ha en fokusgruppe der jeg presenterer en læringsvideo om mentorprogrammer for kvinnelige IT-studenter slik at deltakerene i fokusgruppen kan gi tilbakemeldinger på videoen. Jeg må hente inn kontaktinformasjonen (mail) til deltakerene for å kontakte dem angående tid og sted for fokusgruppen.

Ekstern finansiering
Ikke utfyllt
Type prosjekt
Master

Kontaktinformasjon, student
Tuva Cornelia Oppenhagen, tuvacornelia@hotmail.com, tlf: 95830760

Behandlingsansvar

Behandlingsansvarlig institusjon
Norges teknisk-naturvitenskapelige universitet / Fakultet for informasjonsteknologi og elektroteknikk (IE) / Institutt for datateknologi og informatikk

Prosjektansvarlig
Letizia Jaccheri, letizia.jaccheri@ntnu.no, tlf: 91897028

Er behandlingsansvaret delt med flere institusjoner?
Nei

Utvalg 1

Beskriv utvalget
Studenter fra Brasil

Beskriv hvordan du finner frem til eller kontakter utvalget
Studentene rekrutteres gjennom de ansvarlige for SENOBR prosjektet som jeg reiser til Brasil med

Aldersgruppe
18 - 40

Inngår noen av disse gruppene i utvalget?
- Personer bosatt i land utenfor EU/EØS-området

Hvilke personopplysninger vil bli behandlet om utvalg {{i}}? 1
- Kontaktinformasjon

Figure C.0.1: First page of the Sikt application for focus groups

Hvordan innhentes opplysningene om utvalg 1?

Gruppeintervju

Vedlegg

Intervjuguide - fokusgruppe.pdf

Lovlig grunnlag for å behandle alminnelige personopplysninger
Samtykke (Personvernforordningen art. 6 nr. 1 bokstav a)

Informasjon til utvalg 1

Mottar utvalget informasjon om behandlingen av personopplysningene?
Ja

Hvordan mottar utvalget informasjon om behandlingen?
Skriftlig (papir eller elektronisk)

Informasjonsskriv

Information letter.pdf

Utvalg 2

Beskriv utvalget
Studenter og personer tilknyttet mentorprogrammer fra Norge

Beskriv hvordan du finner frem til eller kontakter utvalget
Gjennom egne nettverk, fra en QR kode som deltakerene scannet på en konferanse og fra deltakere som er intervjuet tidligere i prosjektet

Aldersgruppe
18 - 100

Hvilke personopplysninger vil bli behandlet om utvalg {{i}}? 2

- Kontaktinformasjon

Hvordan innhentes opplysningene om utvalg 2?

Gruppeintervju

Vedlegg

Intervjuguide - fokusgruppe.pdf

Lovlig grunnlag for å behandle alminnelige personopplysninger
Samtykke (Personvernforordningen art. 6 nr. 1 bokstav a)

Informasjon til utvalg 2

Mottar utvalget informasjon om behandlingen av personopplysningene?
Ja

Hvordan mottar utvalget informasjon om behandlingen?
Skriftlig (papir eller elektronisk)

Informasjonsskriv

Information letter.pdf

Tredjepersoner

Innhenter prosjektet informasjon om tredjepersoner?
Nei

Dokumentasjon

Hvordan dokumenteres samtykkene?

- Manuelt (papir)
- Elektronisk (e-post, e-skjema, digital signatur)

Figure C.0.2: Second page of the Sikt application for focus groups

Hvordan kan de registrerte få innsyn, rettet eller slettet personopplysninger om seg selv?
De kan kontakte meg eller prosjektansvarlig å be om å få innsyn, rette eller slette personopplysningene om seg selv

Totalt antall registrerte i prosjektet
1-99

Tillatelser

Vil noen av de følgende godkjenninger eller tillatelser innhentes?
Ikke utfyllt

Sikkerhetstiltak

Vil personopplysningene lagres atskilt fra øvrige data?
Ja

Hvilke tekniske og fysiske tiltak sikrer personopplysningene?

- Fortløpende anonymisering
- Flerfaktorautentisering
- Adgangsbegrensning

Hvor blir personopplysningene behandlet?

- Private tjenester

Hvem har tilgang til personopplysningene?

- Prosjektansvarlig
- Student (studentprosjekt)

Overføres personopplysninger til et tredjeland?
Nei

Avslutning

Prosjektperiode
01.04.2024 - 03.06.2024

Hva skjer med dataene ved prosjektslutt?
Data anonymiseres (sletter/omskriver personopplysningene)

Hvilke anonymiseringstiltak vil bli foretatt?

- Personidentifiserbare opplysninger fjernes, omskrives eller grovkategoriseres

Vil enkeltpersoner kunne gjenkjennes i publikasjon?
Nei

Tilleggsopplysninger

Figure C.0.3: Third page of the Sikt application for focus groups

APPENDIX

D

INFORMATION LETTER - INTERVIEWS WITH MENTORS AND MENTEES

Are you interested in taking part in the research project: How to Create a Mentoring Program for Female Computing Students?

I invite you to participate in a research project where the main purpose is to gain insight into the participant's experiences with participating in a mentoring program. In this letter I will give you information about the purpose of the project and what your participation will involve.

Purpose of the project

My aim is to get insight into how the mentoring program worked and the participant's experiences with participating in the program. These insights will be inspiration for the development of guidelines for establishing mentoring programs for female computing students, as well as guidelines on how to mentor female students.

Who is responsible for the research project?

Master student, Tuva Cornelia Oppenhagen, is the individual responsible for the project. The Norwegian University of Science and Technology (Norway) is the only data controller.

General information – project group:

The leader of the project is Letizia Jaccheri, Full Professor at the Department of Computer Science at NTNU, e-mail letizia.jaccheri@ntnu.no, IT-bygget, phone number: +47 91897028.

What does participation involve for you?

Your participation involves participating in an interview about how the mentoring program worked and your experiences participating in the program. The interview will be audio recorded, and further analyzed.

Participation is voluntary

Participation in the project is voluntary. You can withdraw your consent at any time without giving a proper reason. You may kindly notify me of your willingness to withdraw in person or by email at the following mailing address: tuvaco@stud.ntnu.no. All information about you will then be discarded.

Your personal privacy:

I will only use your personal data for the purpose(s) specified in this information letter. I will process your personal data confidentially and in accordance with the data protection legislation according to the General Data Protection Regulation and Personal Data Act.

- Only the researcher conducting this study and the supervisors will have access to your personal data.
- Data will be stored on a computer.
- Access to data stored on the device is protected by password and two factors authentication. The list of names, and respective codes will be stored separately from the rest of the collected data.
- Microsoft will be used to collect and store personal data.
- Participants in this study will not be recognizable in any resulting report or publication.

Your rights

You have right to:

Figure D.0.1: First page of the information letter

- Access the personal data that is being processed about you.
- Request that your personal data is deleted from all devices and data storage.
- Request that incorrect personal data about you is corrected/rectified.
- Receive a copy of your personal data, and
- Send a complain to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

What gives me the right to process your personal data?

I will process your data based on your consent. Based on an agreement with Norwegian University of Science and Technology (NTNU), NSD – The Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with data protection legislation.

Where can I find out more?

If you have any question about the project, or want to exercise your rights, reach out to:

- Norwegian University of Science and Technology via Tuva Cornelia Oppenhagen by email: tuvaco@stud.ntnu.no
- Our Data Protection Officer: Thomas Helgesen by email: thomas.helgesen@ntnu.no or by telephone: +47 93 07 90 38
- NSD – The Norwegian Centre for Research Data AS, by email: personverntjenester@nsd.no or by telephone: +47 53 21 15 00 for further questions about the assessment of data protection.

Yours sincerely,

Project Leader | Master student

---------- | ----------

Consent for participation in the study

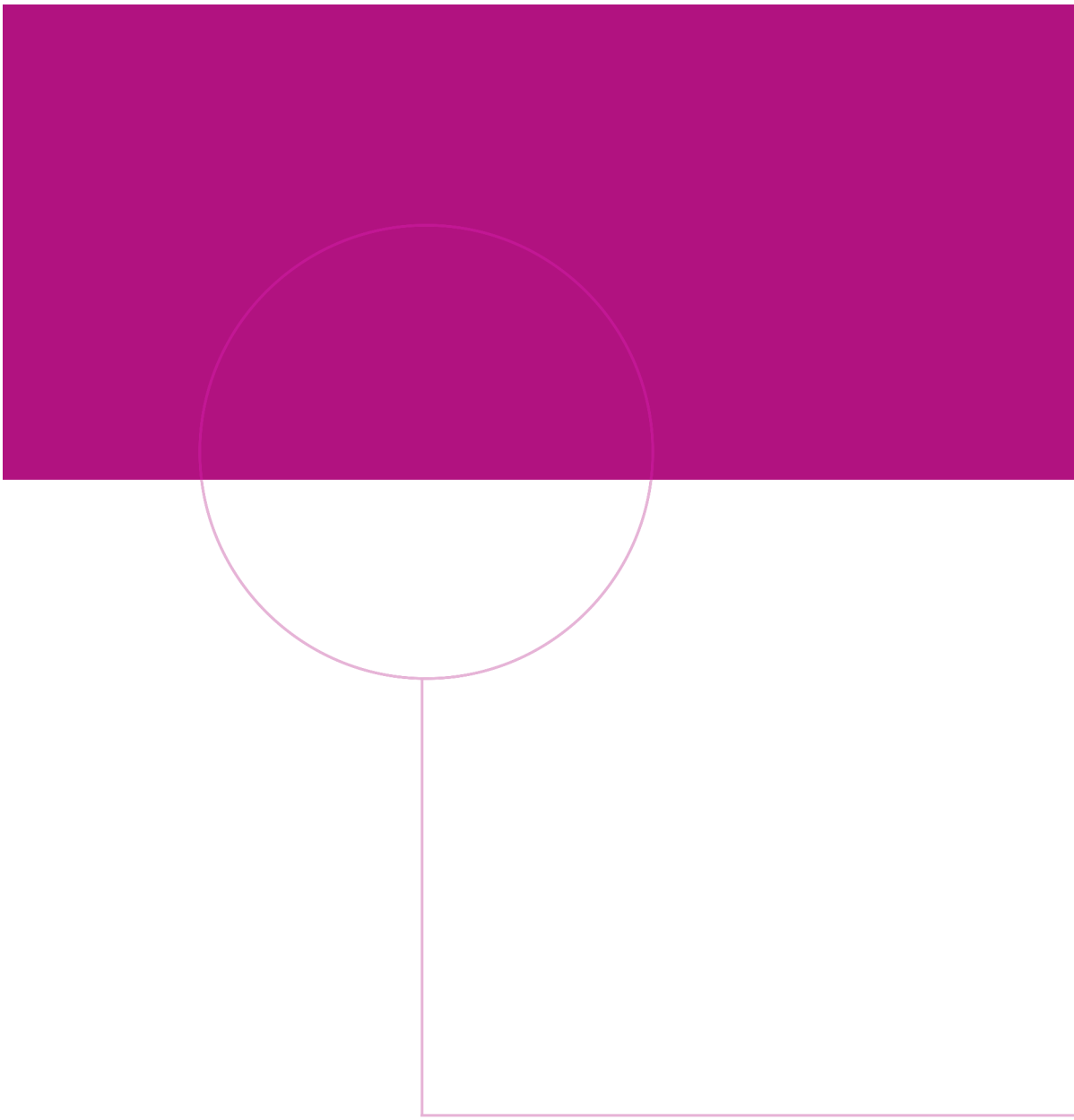
I have received information about the project, and I am willing to give you my consent for my participation to:

- ❑ Interviews sessions

Participant's name: ----------

Signature, date: ----------

Figure D.0.2: Second page of the information letter



NTNU

Norwegian University of
Science and Technology