



## “WE TREAT EVERYONE EQUALLY, BUT...” FINNISH ENGINEERING TEACHERS’ PERCEPTIONS OF GENDERED DIFFERENCES IN GUIDANCE AND COUNSELLING

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### ABSTRACT

Gender segregations in the fields of engineering and technology remain persistent. The number of women studying STEM in higher education is around 20 %, but there are varieties in these fields, i.e. both horizontal and vertical divisions. The segregation continues in working life as differences in career paths.

This study focuses on gendered differences in guidance and counselling in engineering higher education. The data consists of 14 interviews with university teachers and researchers responsible for counselling, guiding or supervising students in thesis writing, tutoring, and working life connections. We examine, 1) what kind of gender equality issues are attached to student guidance practices, 2) whether teachers recognize differences in male and female students' orientation and career expectations, and 3) what kind of gendered stereotypes are read in teachers' descriptions. We approach the data from Joan Acker's conception of gendered organizations, especially in terms of the construction of divisions of labor and the construction of symbols and images.

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Findings reveal that gender equality issues are not much acknowledged. Most interviewees considered guidance as a gender-neutral practice and gender mainly as irrelevant factor. At the same time, they identified some gendered patterns in students' performance and orientation, stereotypical characteristics attached to female and male students, and different expectations of technical skills. Student guidance and supervision plays important role in providing images of technology, its professions, and competences. To trace mechanisms that might have an impact on careers, it is necessary to increase gender awareness and to recognize unconscious bias behind gender-neutral ideals.

## 1 INTRODUCTION

Gender segregations in the field of engineering and technology remain persistent. A concern has been expressed for many years due to the situation that there are relatively few women who enter occupations in the natural sciences, engineering, and technology [1]. In Finland, the overall number of women studying in the fields of technology is 19 % (15 % in ICT). Women make one-fifth (22 %) of students in Master of Science in Technology and employers in technology companies. Within these fields, both horizontal and vertical divisions are considerable. Male-dominated fields in universities consist of mechanical, construction and electrical engineering, automation technology, physics, and IT (10–25 % are women), while relatively more women study in environmental and industrial engineering, material technology, chemistry, architecture and biotechnology and biomedical engineering (30–80 % are women).

The segregation continues in working life as differences in salaries, career paths, jobs, and positions. Women's career advance is somewhat slower compared to men, especially in transition phase from the middle management into highest management [2], while men dominate leadership positions in private sector and listed companies. Median salary for women with university degree in tech or engineering is 87 % of men's salary, mainly caused by different sectors and positions, but 5 % of the wage gap is unexplained [2].

While segregation and wage differential between men and women exists already during studies [3], it is important to observe study culture and practices, and possible gender bias in student guidance and counselling which may influence later careers. This paper is a part of an on-going development project Equal Career Paths – NOW<sup>3</sup> which aims to support and promote equal employment and career development of women particularly in the field of engineering and technology. The project observes causes and consequences of gender segregation and unequal career advance in Finland, targeting especially on transition phase from higher education to working life.

This paper presents early findings of the project research, and it focuses on gendered differences in guidance and counselling in engineering higher education. We examine, 1) what kind of gender equality issues are attached to student guidance practices, 2) whether teachers recognize differences between male and female students in their orientation and career expectations, and 3) what kind of

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gendered stereotypes are read in teachers' descriptions. The data consists of 14 interviews with university teachers and researchers responsible for counselling, guiding or supervising students in thesis writing, tutoring, and working life connections.

Guidance is understood in a wide sense as pedagogical methods and practices that ought to help students to identify their own knowledge, skills, and resources, evaluate the effectiveness of their practices, practice new habits and supports students' engagement and agency [4]. As a theoretical approach in the analysis, we utilize Joan Acker's [5, 6] conception of gendered organizations, especially in terms of *the construction of divisions of labor* and *the construction of symbols and images*.

## 2 METHOD

Thematic, semi-structured interviews with 14 university teachers and researchers were carried out in November 2020 through Zoom video meetings. Interviewees were selected upon their various experience in counselling, guiding and/or supervising duties from all four faculties which, in studied university, offer Master of Science in Technology degrees. Faculties and degree programs represent highly male-dominated fields but also fields with relatively higher number of women. Interviewees work at the faculties and units of Built Environment (Civil Engineering, Architecture), Engineering and Natural Sciences (Automation Technology and Mechanical Engineering, Physics, Materials Science and Environmental Engineering, Industrial Engineering and Management), Information Technology and Communication Sciences (Computing Sciences) and Medicine and Health Technology (Biomedical Engineering). They hold different academic positions with the titles of doctoral/post-doctoral researcher, university teacher, university researcher and professor.

Interviewees consist of six women and eight men, and their experience of active guidance varies from two to 20 years. Their guidance involves supervising bachelor and master thesis (often done in cooperation with companies), guiding different individual and group exercises and laboratory experiments, tutoring students, and following their practical trainings and internship in working life.

Interviews focused on three main themes: equality issues in faculties, perceived gender differences, and (in)equal practices in guidance and counselling. Interviewees were asked for instance to describe the visibility of equality issues in their units (e.g. trainings or discussions), how is the study culture for minorities, whether they have perceived any differences between male and female students and whether there are some key issues to develop regarding equality in guidance and counselling. The data were analyzed by a qualitative, thematic content analysis and quantification. In the first phase, relevant themes and subcategories for each research question were identified and the data was coded under each category. In the second phase, identified themes were classified based on the frequency of their occurrences and related to Acker's conception of gendered mechanisms in organizations. In the last phase, general descriptions of each theme were created with the illustrations from the original data.

### 3 RESULTS

1. Research question: *What kind of gender equality issues are attached to student guidance practices?* Findings reveal that despite various university level equality agenda and campaigns, gender equality issues are not much acknowledged nor debated in faculties. According to the data, engineering teachers are not familiar with the equality work in their university nor the implementation of equality plans. None of the 14 interviewees recalled noticed equality measures would have taken to action in their faculty.

Half of the interviewees (n=7) characterized that in their study environment gender is of no relevance or they have not paid attention to the matter. Most engineering teachers considered student guidance as a gender-neutral practice and did not recognize significant equality problems or different treatment of male and female students. Regarding their own guidance, counselling and tutoring duties, engineering teachers viewed students' gender as mainly irrelevant factor and highlighted their aim to treat everyone similarly. Guidance was described as a process where "we aim to find tools to the matter at hand, regardless of who is sitting on the other side of the table".

A few interviewees brought out some equality-related debates, mainly regarding observable gender divisions and the small number of female students particularly in highly male-dominated fields. In terms of role models visible to students, they referred to the low number of women as professors, tenure-track position holders, researchers, and doctoral candidates, while the share of female teachers is relatively higher in most studied fields. Visiting lecturers who represent high-level managers in companies are mainly men, but some interviewees have aimed at inviting female experts to highlight diversity in working life.

2. Research question: *Do teachers recognize differences between male and female students in their orientation and career expectations?* Interviewees identified some gendered patterns in students' performance and orientation, but little differences in vertical career expectations. On average, female students were described to succeed well in studies, they are motivated, demanding, and active to ask instructions, whereas among male students, there is more variety and higher number of those showing less ambition on excellent grades. At the same time, women were seen to feel more insecure, and to worry about their competence and thus needing for encouragement.

Proportionally high number of female students orientate themselves towards pedagogical studies to become qualified as teachers, whereas programming, for instance, attracts more male students. A few teachers also assumed women to be less interested in male dominated environments as construction sites, and more attracted to design, economics, and protection of buildings. Men were described to be more determined in early stage of studies in becoming managers. Descriptions of study choices and directions revealed also implicit valuation given to different competences, as for instance pedagogical orientation was characterized less important and out of "proper", core technology.

3. Research question: *What kind of gendered stereotypes are read in teachers' descriptions?* The data reveals stereotypical characteristics and different expectations of technical skills attached to female and male engineering students. Some interviewees pointed out cultural beliefs about women's weaker mathematical competence, and assumptions of less previous experience in technical skills. Such

descriptions reveal the idea of technical competence and knowledge as more natural to men, as shown in male the image of “a super nerd who is born with the keyboard in hand”.

At the same time, female students were attached with the qualities of conscientiousness, accuracy, diligence, and keeping to the schedules while male students more often adopt nonchalant attitude towards studies. Women’s tendency to take their performance seriously was related to their ways of showing emotions, and crying, which, for male students’ part would be unexpected. In contrast to women’s wish to handle everything, men were assumed to be confident about their interests and straightforward in focusing on the key issues.

Findings suggest that gendered differences in engineering higher education are constructed in relation to mathematic and technical competences and expectations, typical and allowed behavior, ways to approach and perform studies, and divisions of work.

According to Acker [5, 6] organizations reproduce gendered inequalities through various mechanisms. First, *the construction of divisions of labor* involves allowed behaviors, allowed locations in physical space, and allowed power, including institutionalized means of maintaining divisions in the structure of labor market. In the data, this was illustrated by role models available for students, representing the images of technical work and professions. Some gender typical choices are seen to guide interests and orientations of female and male students within and between the fields of study. Furthermore, attitudes towards suitable behavior for female and male students were read in teachers’ descriptions, as well as expectations about technical understanding and skills.

Second, *the construction of symbols and images* involves ways to express or reinforce divisions between women and men, in the forms of language, ideology and dress. In the data, characterizations and comparisons shape certain images of engineering student and views of proper technology with its competences. As example of the latter, pedagogical knowledge or discussion about social roles or group dynamics is assumed to be of interest to female students but also viewed as unimportant.

From the perspective of everyday practices in guidance and counselling, gendered expectations and stereotypes stay easily hidden and unidentified. The data reveals that most engineering teachers have not considered gender issues or find them unproblematic. On the other hand, some interviewees identify the need to broaden the image of engineering and technology in terms of diversifying the role models visible to students, or to develop career counselling processes to become more gender aware.

#### **4 CONCLUSION - FROM GENDER BLIND TO GENDER AWARE IN STUDENT GUIDANCE AND COUNSELLING**

Findings indicate some contradictions between gender neutral ideals and gendered differences in engineering higher education. Student guidance is considered as a gender-neutral practice where gender plays irrelevant role, and most teachers have not reflected the issue. At the same time, they identify some gendered patterns in students’ performance and orientation, stereotypical characteristics attached to

female and male students, and different expectations of technical skills. These elements also serve as mechanisms that construct and maintain images of technology and divisions of work.

The field of technology is exceptionally gendered and segregated in Finland. Student guidance and supervision in engineering higher education plays important role in providing images of technology, its professions, and competences. To trace mechanisms that might have an impact on careers or hamper the equal advance of women in working life, it is necessary to recognize unconscious bias behind gender-neutral ideals. In this paper, we identified some perceived gendered differences and practices in student guidance and counselling, which is a step towards increasing gender awareness in engineering higher education, and to develop tools to reduce segregations in the fields of technology.

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