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# Practical and Project Work in Computer Science Education

Funded by Chalmers' Genie - Program  
Chalmers | Gothenburg University

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# Motivation 1: Yearly Study Barometer

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Women in SE programs report to be:

- ***more stressed*** and report a worse balance between studies and private life than their male peers
- ***more socially isolated***: lack of social contact is named the main hinderance for studying by women on master level (while it plays rarely a role for the men)
- Fewer women perceive their study environment as free of discrimination (compared to men)

# Motivation 2: Research

- ***a) Biases in teamwork: perception and behavior:***
  - Different ways of working in OSS (Catolino et al. 2019)
  - Women tend to perform less technical tasks in OSS (Robles et al. 2016)
  - Gender-typical communication differences lead to lower perceptions of women's qualification and ability to contribute to group work among engineering students (Wolfe & Powell 2009)
- ***b) Need for sense of belonging and working harder:***
  - Women in STEM1 higher education feel pressure to work harder to be accepted and succeed (Blackburn 2017)
- ***c) Limited access to online resources:***
  - Stackoverflow: women engage less and have lower reputations than men (Vasilescu et al. 2012)
- ***d) Limited participation in open source software projects:***
  - Women still contribute less to open source software (OSS) projects (Robles et al. 2016)
  - Likely reasons: avoidance of competitive situations and lower confidence (Wang et al. 2018)

# Concerns

- **C1:** Women are likely to benefit less from team and project-based learning in computer science.
- **C2:** Women are likely limited in their access to online learning resources (impacting the benefit of project-based learning).
- **C3:** Women are likely to make limited use of outer curricular learning opportunities, especially in context of OSS.

But, project courses present

- ***more than half of the credits*** in core software engineering courses in Master's courses
- ***4 out of 5*** core software engineering courses in the Bachelor

# Project

- Funded by *Chalmers' Genie initiative*

The screenshot shows the Chalmers website with a navigation menu at the top: CHALMERS Education Research Collaboration About Chalmers. A search bar and a language selector 'På svenska' are also visible. The breadcrumb trail reads: Start > About Chalmers > Chalmers for a sustainable future > Initiatives for Gender equality > Genie | Gender Initiative for Excellence > About Genie. On the left, a dark sidebar contains a menu with items like 'Organisation', 'Chalmers University of Technology Foundation', 'Chalmers for a sustainable future', 'Vision, goals and strategies', 'Our role in sustainable development', 'Initiatives for Gender equality', 'Genie | Gender Initiative for Excellence', 'Genie in articles and media', 'Updates from the Genie team', 'About Genie', 'Genie articles and filmed seminars', 'Resources on gender equality', 'Visiting researcher programme', and 'Initiatives for Learning and learning environment'. The main content area is titled 'About Genie' and contains the following text:

Like other technical universities, Chalmers has a very low proportion of women in its faculty. However, research shows that a more even gender balance leads to greater scientific success and a better working environment, for both men and women. As a strategy to become more excellent, Chalmers aims to increase the proportion of women among its faculty.

**Overall goals**

The overall goals of the project:

- Increase the proportion of female faculty
- Remove the structural and cultural obstacles that hamper women's careers
- Create a working environment that is diverse and inclusive and supportive of excellence in research and teaching

**Scope**

The initiative is funded by the Chalmers University of Technology Foundation and has a budget of SEK 300 million over the course of ten years. It was launched on 1 January 2019 and run through 2028. As far as Chalmers knows, this is by far the largest individual investment in gender equality made by any university.

**Content**

Genie mainly consists of two parts: **concrete and tailored action plans, to achieve long-term cultural and structural change in the departments**, and **direct support to increase the fraction of females in the faculty**.

**Gender equality work**

The work includes analysing culture, systems and processes in each department. Statistics divided into men and women will be used to identify and address imbalances. Genie's management will provide each department's leadership group with tailor-made activities that aim to increase gender equality.

# Project

- Funded by *Chalmers' Genie initiative*
- 2 Universities, 2 Bachelor and 2 Master's Programs

## Goal:

- Identify how our students are affected by mechanism known from literature
- Develop interventions to support teachers and female students to *mitigate the concerns C1-C3*

	VT 2020	HT 2020/21	VT 2021	HT 2021/22
Phase 1: Exploration and Replication				
Phase 2: Intervention Development				
Evaluation of Interventions				

# Phase 1: Exploration & Replication

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Tool 1: Questionnaires to students and teachers participating in project courses

- First iteration: Spring-term 2020

Tool 2: Interviews

- Volunteers are interviewed over the course of one year
- About to start soon

# Early Results Questionnaire

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- Part 1: 70 answers (send to 556 students, 12,5% response rate)
- Part 2: 49 answers (send to 381 students, 12,8% response rate)
  
- Female and male students aim for different tasks at the beginning of a course
  - Male students report having done more quality assurance
  - Female students report having done more coding
  - Both is contrary to the aims formulated during the course start
  
- Online Resources:
  - More male students report to use manual and static online resources (youtube, tutorials, wikis...)
  - No significant difference in the reported use of online communities, e.g. stack overflow



# Summary

## Motivation 2: Research

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Genie means concrete and tailored action plans, to achieve long-term cultural and structural change in the departments, and direct support to increase the fraction of females in the faculty.

**Gender equality work**

The work includes analyzing cultural systems and practices in each department. Statistics divided into men and women within each research and technical initiative. Genie management will provide each department's leadership group with tailor-made actions that aim to increase gender equality.

# References

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