



Students' Perception of Digitalisation in German Computer Science Programmes

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Students of the future in fields of the future?

“Right now, fewer than one in five bachelor’s degrees in engineering or computer science are earned by women. Fewer than three in 10 workers in science and engineering are women.

*That means we've got half the field - or half our team we're not even putting on the field. We've got to change those numbers. These are the **fields of the future.**”* (Barack Obama, 2014)

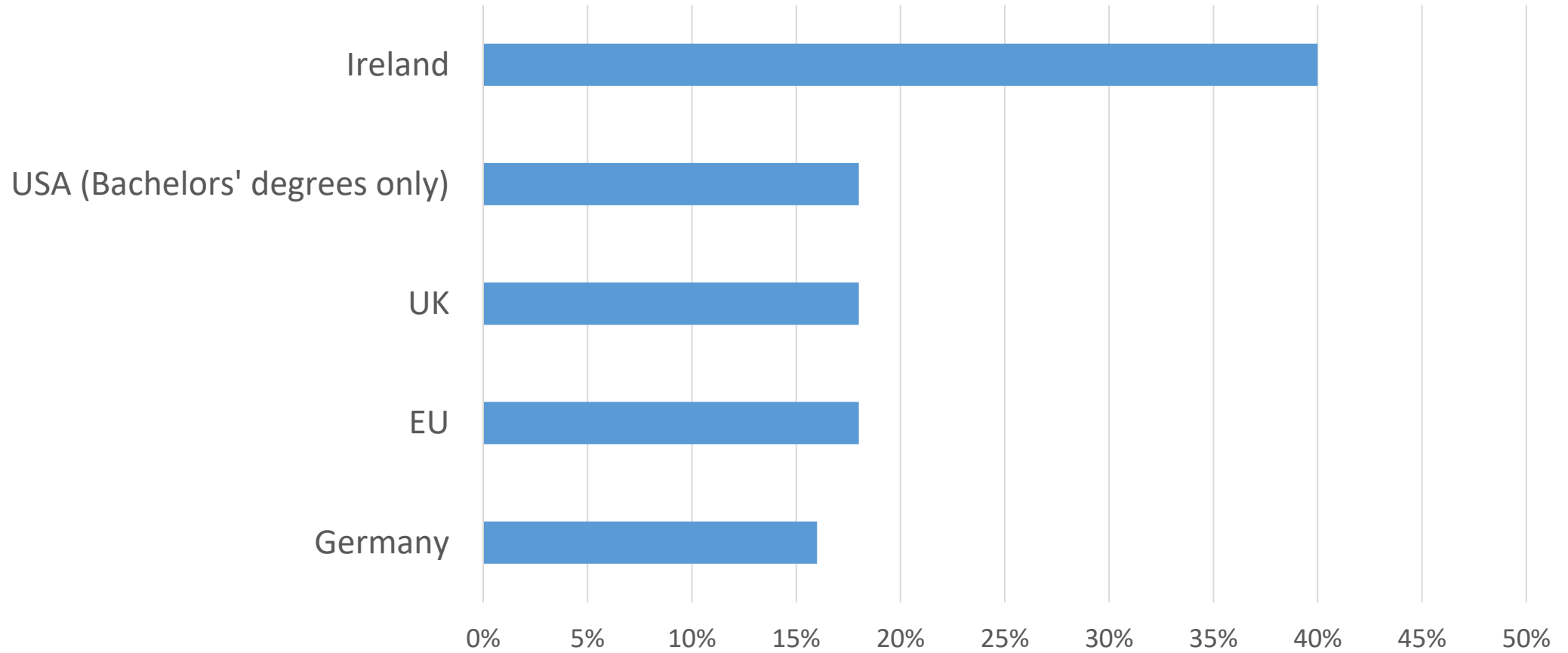
Top 10 Emerging

1. Data Analysts and Scientists
2. AI and Machine Learning Specialists
3. General and Operations Managers
4. Software and Applications Developers and Analysts
5. Sales and Marketing Professionals
6. Big Data Specialists
7. Digital Transformation Specialists
8. New Technology Specialists
9. Organisational Development Specialists
10. Information Technology Services

Source: Future of Jobs Report 2018, World Economic Forum

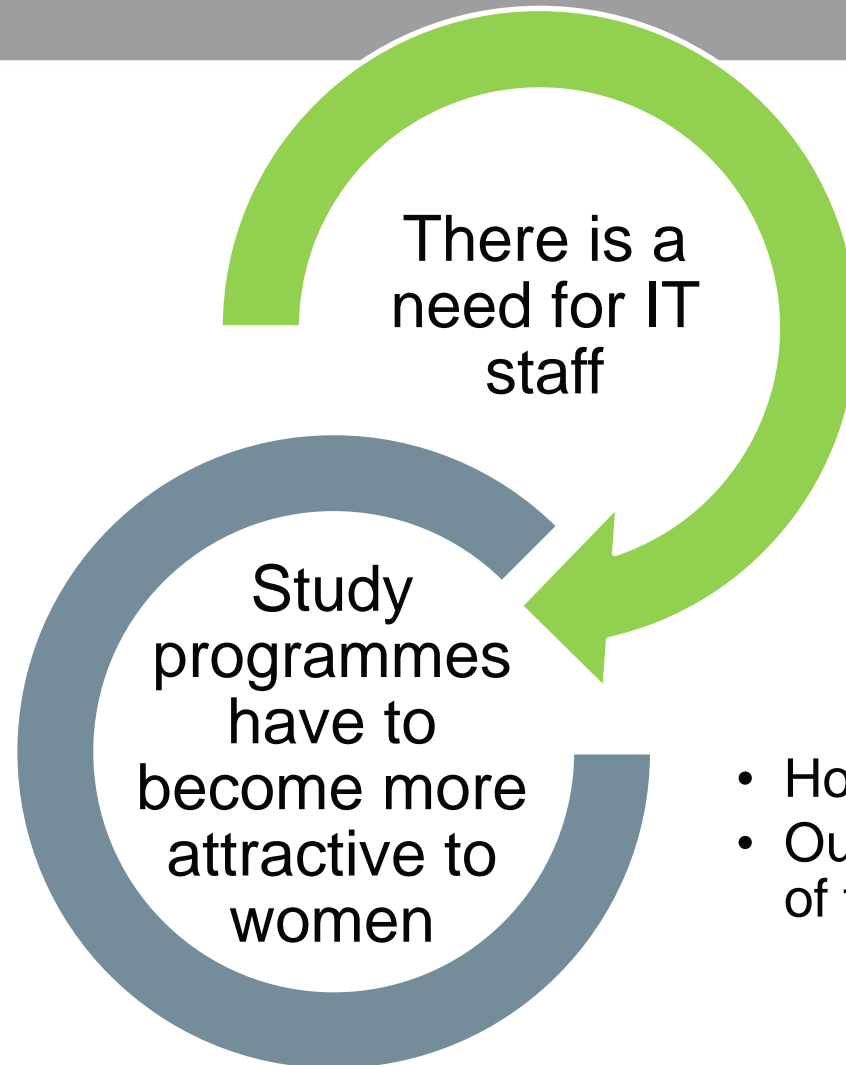
<http://reports.weforum.org/future-of-jobs-2018/>

Female students in Computer Science 2012



Sources: Eurostat, US Department of Education

Why is that a problem? What is the solution?



- Firms have problems to find enough employees
- Good job and earning opportunities
- Women are underrepresented
- Participation in job / earning opportunities would decrease “gender pay gap”

- How to achieve that goal?
- Our project wants to raise awareness of that topic.

CHE Research project: FRUIT - „Frauen in IT“ (Women in IT)

Funded by the German Federal Ministry of Education and Research

Question: Do Computer Science study programmes become more attractive to women by...

changing the contents

- Combination with other field of study like Biology, medicine
- Interdisciplinary content
- show creative or communicative side of CS
- ...

integrating practice

- Cooperate Education
- Lecturers with practical experience
- Practice phases
- methods/tools from professional practice
- ...

adding flexibility

- Individual schedule
- No compulsory attendance
- Courses offered in the evening
- Flexible modules
- Study part-time
- Self-study phases
- ...

enhancing digitalisation

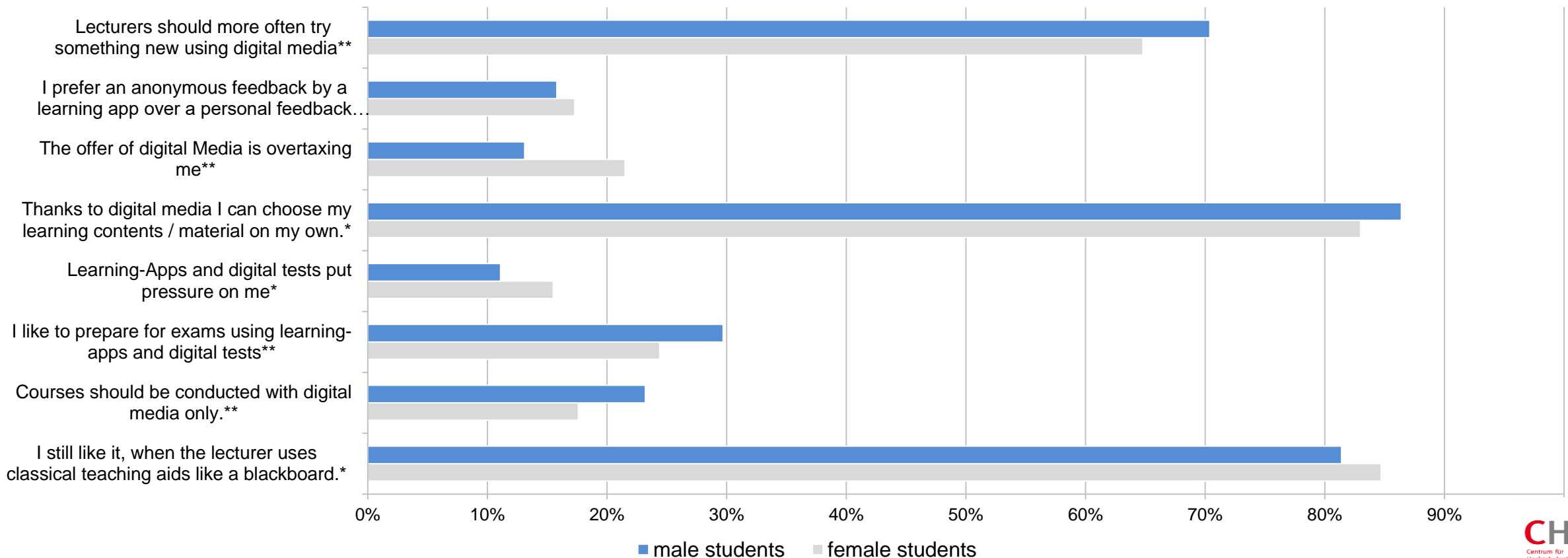
- Blogs
- Chats
- MOOCs
- Web conferences
- Learning apps
- Social networks
- Microblogging
- Online exercises
- PDF
- ..

Why should digitalisation make courses more attractive to women?

- Literature on digitalisation in German Higher Education still rare (Albrecht & Revermann, 2016)
- Digitalisation can be seen as one aspect of flexibilisation
 - Flexibility seems to be more important to female *employees* (*Impulse*, 2013)
 - Students with little children (in the majority female students) might profit from digitalisation, because they have less time budget for presence learning (Middendorff, Poskowsky, & Kandulla, 2013)
- On the other hand: Women seem a little more sceptical about using digital media in university teaching according to *Monitor digitale Bildung* (Schmid, Goertz, Radomski, Thom, & Behrens, 2017)

Women are a little more sceptical, but neither gender wants „digital teaching only“

Opinions of male and female students regarding the use of digital media in university teaching
Percentages of „I totally agree“ plus „I agree“ (4-point-scale)





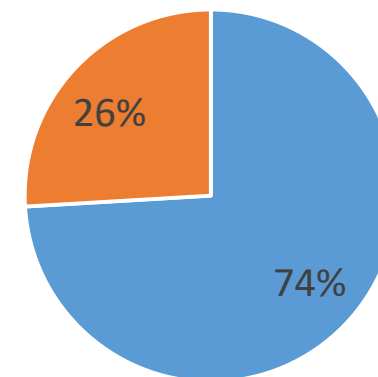
What kind of digital teaching methods are preferred by Computer Science students?

Are there gender differences?

Which implications does this have for course design?

Method

- Survey among Bachelor's degree students in Computer Science in Germany
- Survey was conducted from fall 2017 until spring 2018
- Two ways of recruitment: 1. Student survey for the CHE University Ranking; 2. Degree program coordinators in three (of 16) selected federal states States (Baden-Wuerttemberg, Thuringia and Mecklenburg-West Pomerania)
- 2.601 participants



■ male ■ female

Results

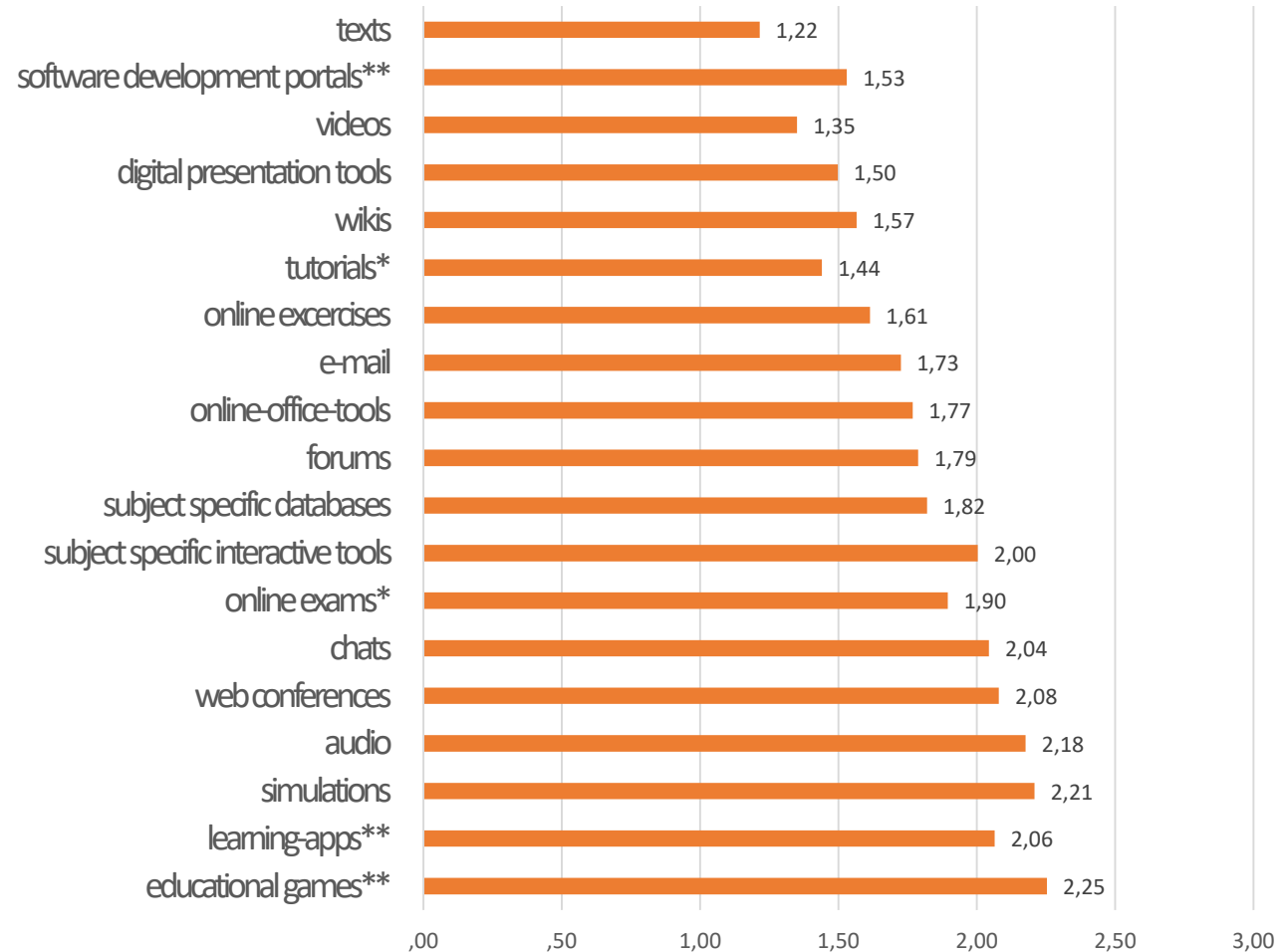
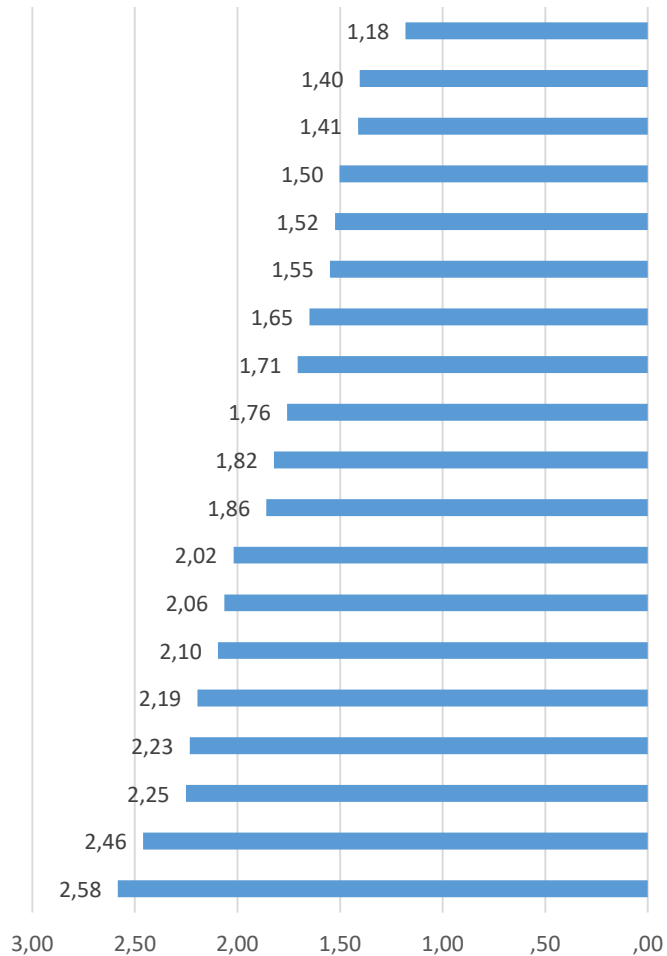
For most German Computer Science students digital teaching does (rather) not take place!

Mode of teaching / learning	happens often	happens	does rather not happen	does not happen
Presence learning - lectures	88,7%	7,3%	2,4%	1,6%
Presence learning - excercises	83,1%	14,9%	1,4%	0,6%
group work among students	49,3%	41,4%	7,9%	1,5%
presence learning - seminars	28,8%	40,0%	23,8%	7,4%
presence learning - interships	25,1%	37,8%	22,4%	14,7%
project seminars / project work	21,8%	59,9%	14,2%	4,1%
self-learning (with guidance)	18,6%	35,8%	30,5%	15,2%
e-learning formats	9,7%	28,3%	28,9%	33,1%
blended learning formats	9,6%	27,9%	26,6%	35,9%
digital learning formats (apps, simulations)	4,6%	13,0%	33,6%	48,8%

How helpful are digital teaching formats for you?

male students

female students



*p<0.05, **p<0.01, two-tailed chi-square-test for independence; scale: 1=very helpful, 2=helpful, 3=less helpful, 4=not helpful)

To summarize it...



There is a need for IT-Experts (Computer Science graduates) in Germany and worldwide

Women are underrepresented among CS students (and employees)

Digitalisation is discussed as one aspect of course design to make CS programmes more attractive to women

The use of digital teaching methods is rather seldom in Germany, even in Computer Science

There are larger differences in the perceived usefulness of different digital teaching formats

There are only small gender differences in the perception between male and female (computer science) students

Digital teaching may make courses more attractive – but not especially for one gender.



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