How to make degree courses in IT more attractive to women

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Research Question:
How does the design of the degree courses in computer science influence the proportion of female students?

Background

Information Technology is one of the key drivers of today's economy and society. IT Experts are urgently needed for the labour market, opening good job opportunities for students of computer science. However, the proportion of female students in computer science in Germany is only around 20 percent. Thus, getting more women to study computer science would satisfy the needs of the labour market as well as provide good income opportunities to more women.

Structural Analysis

Data were drawn from the Higher Education Compass of the German Rectors' Conference (2016), the CHE University Ranking (CHE Centre for Higher Education, 2016) as well from the German Federal Statistical Office (2017). 1,067 out of a total of 1,155 degree courses in computer science offered in Germany were analysed. The proportion of women in the degree courses was set in relationship to the degree courses' interdisciplinarity, relationship to practice and flexibility.

Hypotheses and Results

Hypothesis 1: Degree courses that combine computer science with other disciplines are more attractive to female students.

Interdisciplinarity courses, which include "female" subjects like biology or medicine are favoured by women (Stewart, 2003; Schinzel, 2007).

Fig. 1: Proportion of female students in subdisciplines of computer science

The results show large differences between the various subdisciplines of computer science.

While in bio- / medical informatics more than a third of the students are female we find only below 17 Percent of female students in rather general computer science degree courses.

Hypothesis 2: Degree courses that have a greater relationship to practice are more attractive to female students.

Women are "differently interested" in technical science (Gensch, 2014).
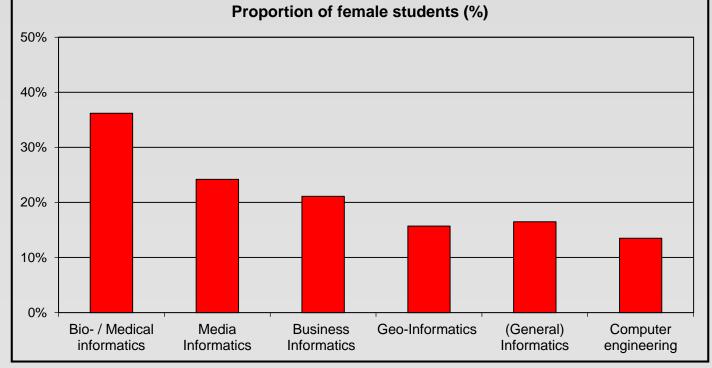
Tab. 1: Proportion of female students in cooperate education and extra-occupational degree courses

Subject area	Proportion of female students (%) (Total number of students)		Sig. (X²)	Proportion of female students (%) (Total number of students)		Sig. (X²)
	Cooperate education	not cooperate education		Extra-occupational	not extra-occupational	
Bio- / Medical informatics	41.0% (351)	36.1% (9,429)	not sig.	28.8% (66)	36.3% (9,714)	not sig.
Media Informatics	20.8% (2,028)	24.5% (23,387)	**	16.8% (671)	24.4% (24,744)	**
Business Informatics	19.8% (10,807)	21.3% (54,382)	**	15.9% (9,061)	21.9% (56,128)	**
Geo-informatics	14.8% (1,701)	15.8% (12,923)	not sig.	-	15.7% (14,624)	-
(General) Informatics	12.6% (9,397)	16.9% (102,627)	**	13.7% (5,123)	16.6% (106,901)	**
Computer Engineering	7.0% (966)	13.8% (22,688)	**	12.9% (1,381)	13.5% (22,273)	not sig.

*sign. Diff. (p<0.05), two-tailed chi square test of independence; **sign. Diff. (p<0.01), two-tailed chi square test of independence

In contradiction to our hypothesis we find significantly *lower* proportions of women in cooperate education courses as well as in extra-occupational courses.

An additional correlation analysis yielded no relationship between CHE Ranking indicators for high relationship to practice of a degree course and the proportion of female students.
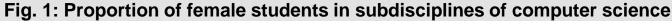
Hypothesis 3: Degree courses that offer a greater flexibility are more attractive to female students.

Women favour flexible work models (Stewart, 2003; Impulse, 2013).

Tab. 2: Proportion of female students in distance-learning and part-time degree courses

Subject area	Proportion of female students (%) (Total number of students)		Sig. (X²)	Proportion of female students (%) (Total number of students)		Sig. (X²)
	Distance learning	Presence learning		Part-time	Full-time	
Bio- / Medical informatics	28.8% (66)	36.3% (9,714)	not sig.	32.2% (826)	36.6% (8,954)	not sig.
Media Informatics	26.4% (1835)	24.0% (23,580)	*	22.6% (6,716)	24.7% (18,698)	**
Business Informatics	17.2% (10,808)	21.8% (54,381)	**	19.9% (21,099)	21.7% (44,090)	**
Geo-informatics	45.5% (55)	15.6% (14,589)	*	16.8% (1,033)	15.6% (13,591)	not sig.
(General) Informatics	14.6% (11,302)	16.7% (100,722)	**	15.4% (25,668)	16.8% (86,356)	**
Computer Engineering	11.9% (1,379)	13.6% (22,275)	not sig.	12.9% (4,197)	13.6% (19,457)	not sig.

*sign. Diff. (p<0.05), two-tailed chi square test of independence; **sign. Diff. (p<0.01), two-tailed chi square test of independence

As is the case for Hypothesis 2, Hypothesis 3 must be rejected for the most part. In most cases, the proportion of female students is *lower* in those degree courses that offer a greater flexibility.

Discussion

Interdisciplinary courses

The proportion of women varies with the focus area of application of the course. Courses that focus on bioinformatics, medical informatics or media informatics yield a significantly higher proportion of women than more general computer science degree courses. Including (and communicating) more "female" contents could be a way to make degree courses in computer science more attractive to women.

Relationship to practice

Degree courses with a higher relation to practice do *not* yield a higher proportion of women, rather a lower one. The kind of "practice orientation" that the women are supposed to be interested in may rather be satisfied by putting computer science into an application context (e.g. bio-informatics, medical informatics, media informatics) instead of including more practical elements in the curriculum. In the case of cooperate education courses, the recruitment practice of the companies that select the students for cooperate education should be investigated.

Flexibility

Flexible forms of study like part-time or distance-learning courses rather yield a *lower* proportion of female students then less flexible forms. Even though more women then men work part-time, this kind of flexibility does not seem to be needed likewise by women at the age they go to university. In this period of life young women in most cases do not have to take care of children yet, allowing them to study full-time. Flexible courses might therefore rather meet the needs of male professionals that are already working in the IT-sector and use the degree programme for further qualification.

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