Do Single-sex Educational Programmes in STEM Disciplines Reduce the Drop-out Rate of Female Students?

Prof. Dr. Ulrike Busolt, Dr. Karin Ludewig, Susanne Schmidt, Netzwerk F.I.T

Overview

- Introduction: women in STEM in Germany
- Single-sex educational programmes informatica feminale Baden-Württemberg & meccanica feminale
- Analysis of survey results
- Conclusion

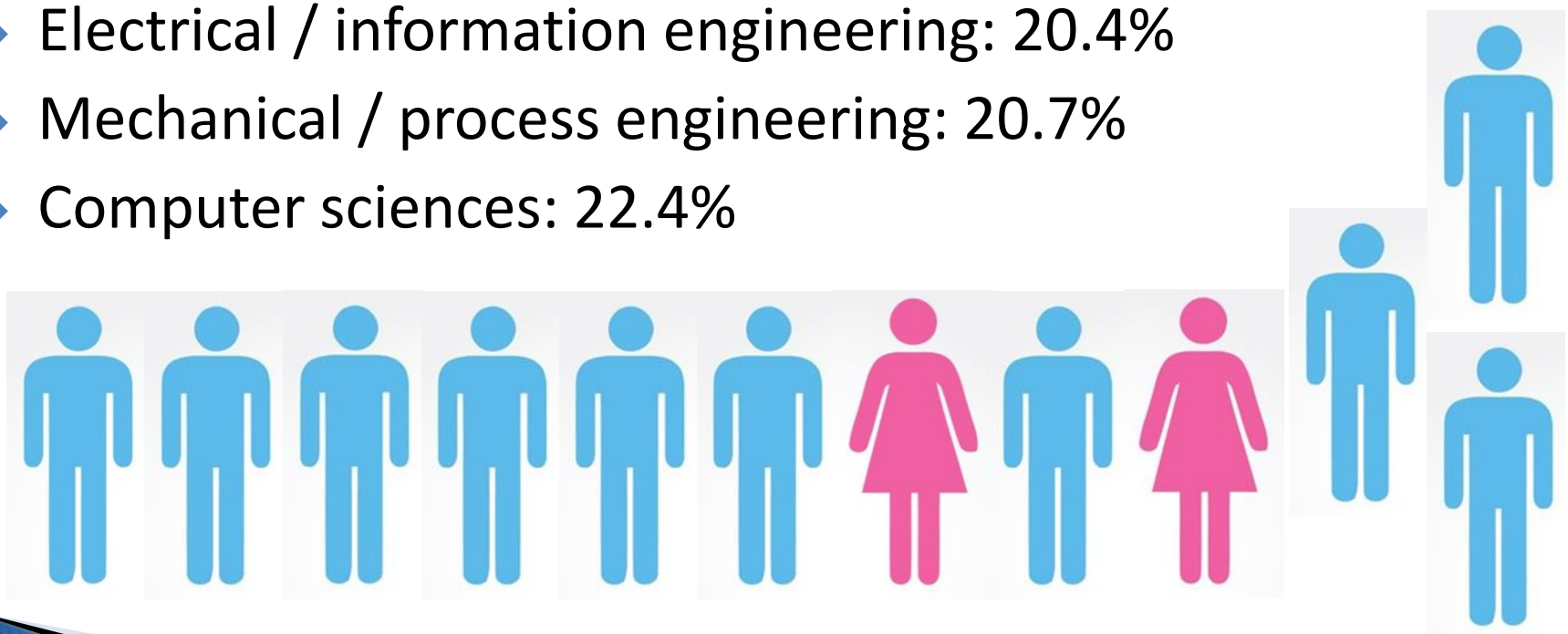
Women in STEM in Germany (female first-year students)

	1995	2000	2005	2010	2015	2016	2017
electrical / information engineering	7.7	11.4	14.7	16.6	19.6	**18.3**	20.4
mechanical / process engineering	12.6	18.8	16.5	20.1	25.3	**25.1**	20.7
computer sciences	9.4	16.6	19.0	17.6	21.6	**19.8**	22.4
mathematics	42.0	40.9	44.9	44.2	43.3	**43.1**	
physics / astronomy	17.4	22.2	19.5	20.3	21.5	**25.1**	
biology	61.2	64.2	65.3	65.2	65.5	**65.2**	
chemistry	39.9	48.2	47.8	49.0	45.9	**50.7**	

Source: Statistisches Landesamt Baden-Württemberg (Federal Statistical Office of the land of Baden-Württemberg, www.statistik-bw.de); figures refer to first-year students at German universities.

Women in STEM in Germany (female first-year students)

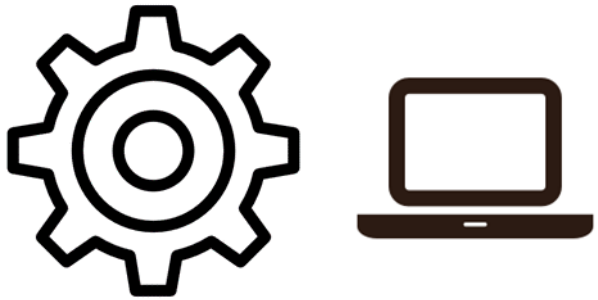
- Women are clearly underrepresented (2017):
- Electrical / information engineering: 20.4%
- Mechanical / process engineering: 20.7%
- Computer sciences: 22.4%



Source: Statistisches Bundesamt (Federal Statistical Office, www.destatis.de); figures for 2017 are preliminary and refer to first-year students at German universities.

Drop-out rate

- Drop-out rates are high in engineering careers
- For males even higher than for females
- Drop-out rate for female first-year students of engineering sciences in Germany in 2010/11 was **27%.**



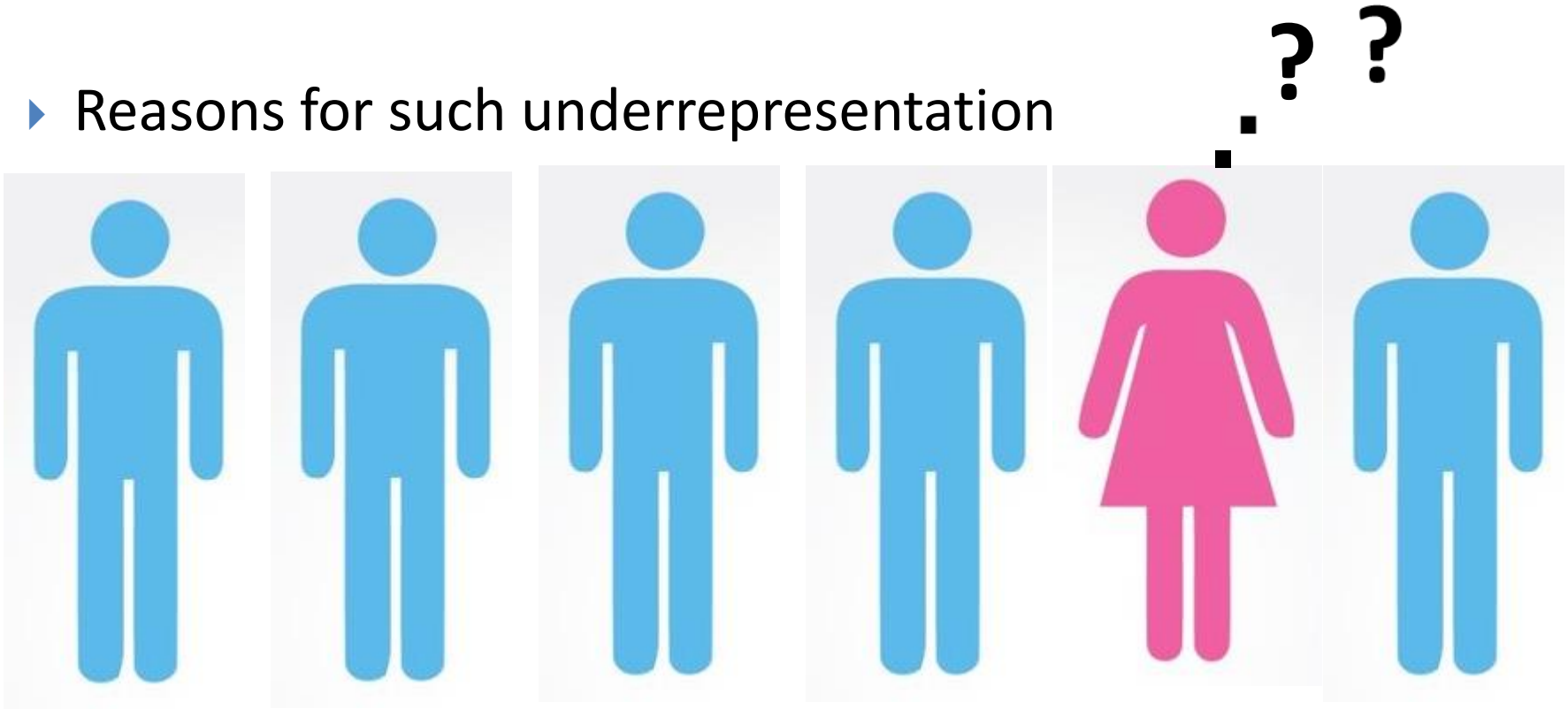
Drop-out rate

	Drop-out rates in % (Germany) for					
	First-year students (male+female)			First-year students (female)		
	2006/7	2008/9	2010/11	2006/7	2008/9	2010/11
engineering sciences (universities)	48	36	32	42	33	**27**
engineering sciences (universities of applied sciences)	30	31	33	28	26	**27**
mechanical engineering	38	33	32			
electrical engineering	41	40	43			
computer sciences	35	37	43			

Source: Heublein et al. Zwischen Studienerwartungen und Studienwirklichkeit, Forum Hochschule 1/2017, Deutsches Zentrum für Hochschul- und Wissenschaftsforschung GmbH, pp. 290-293. For the mentioned three technical careers data is missing.

You may be wondering …

- Reasons for such underrepresentation



Reasons for underrepresentation of women in STEM

- General gender stereotypes / expectations
- Lack of self-confidence
- …?

Consequences of underrepresentation of women in STEM

- Individualisation => isolation
- Feeling of strangeness
- Competitive atmosphere
- …

Reasons for drop-out (both sexes)

- Performance problems
- Lack of previous knowledge in maths and sciences
- Lack of skills in time management and self-reliant studying / training
- False expectations
- …

So what?

- Gender equality => overcome gender pay gap
- Skills shortage in Germany

- => government funds measures against underrepresentation of women in STEM (since the 1990s!)

Measures taken to rise the percentage of women in STEM

- Special grants for female students and researchers
- Professorships for female researchers
- Role models (e.g. exposition on great female inventors)
- Mentoring programmes
- Preparatory courses in maths for female pupils to bridge the knowledge gap between school and college
- Girls‘ days
- STEM educational programmes for women only (students and professionals)
- …

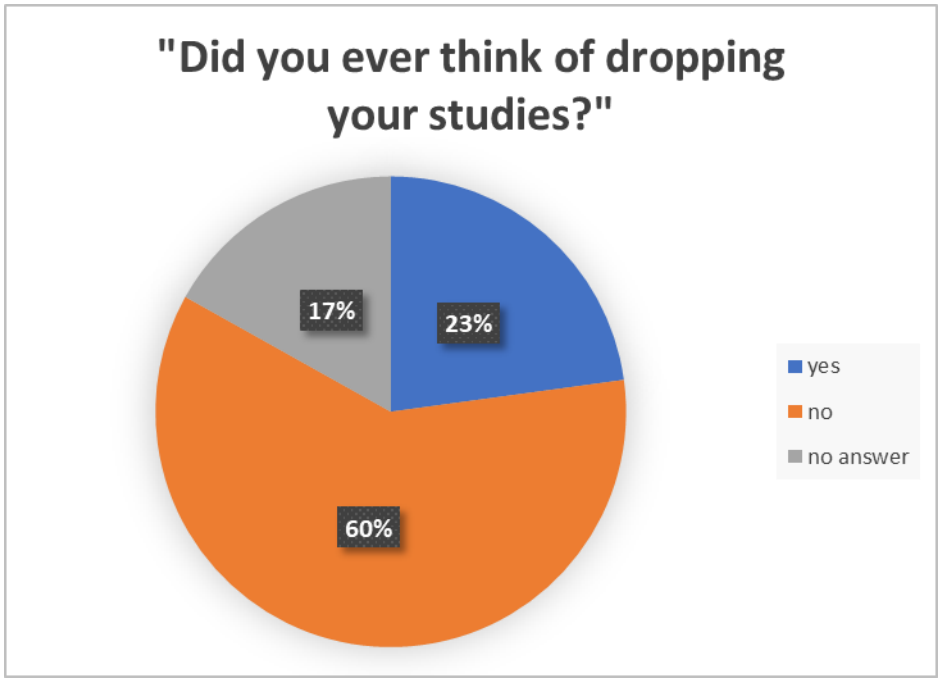
Informatica feminale / meccanica feminale

- Summer / spring schools
- Duration: 1 week
- Single-sex (females only)
- Teaching of hard and soft skills
- Small learning groups
- Individual mentoring
- Role models
- Networking

Self-evaluation of informatica feminale / meccanica feminale

- Questionnaires: ever since the first event (2001)
- 2012 – 2017: questions on study drop-out

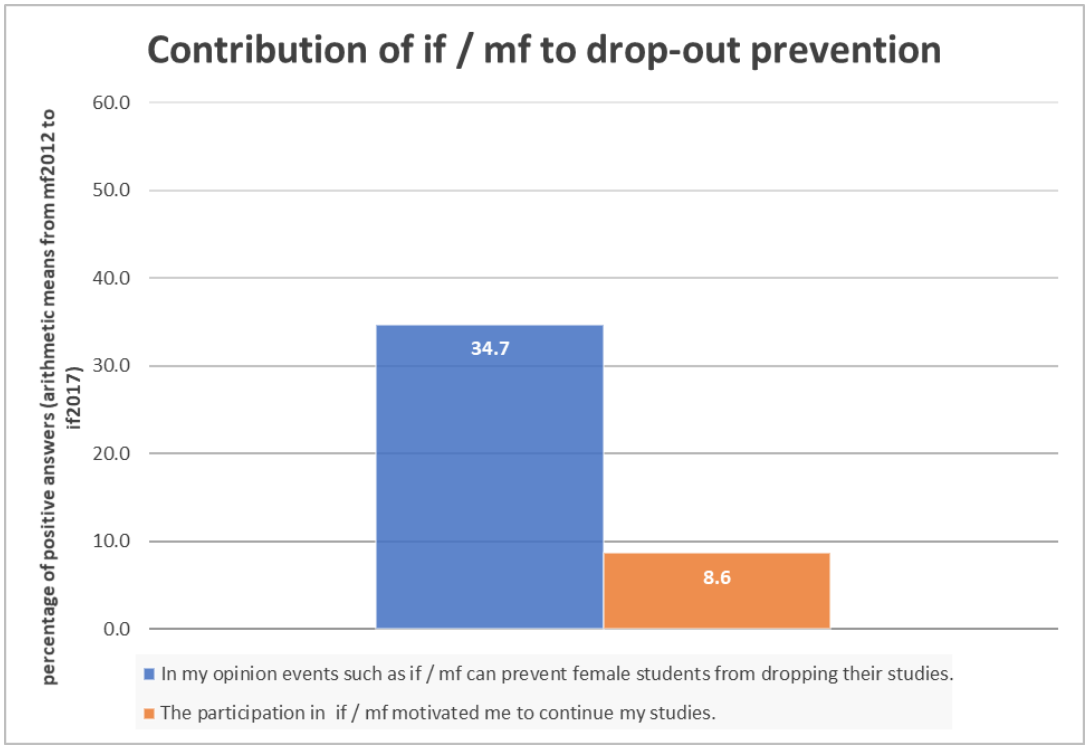
Survey results



23% of participants of informatica feminale / meccanica feminale have considered dropping their studies.

n=77

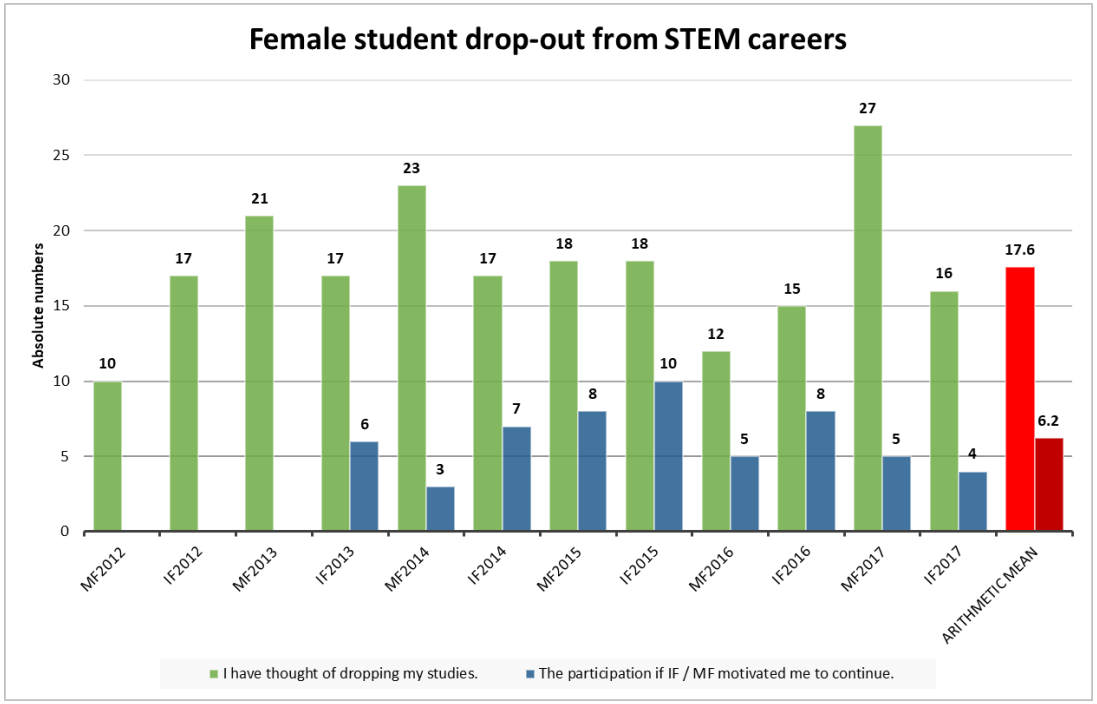
Survey results



8.6% of participants were motivated to continue their studies by taking part in the event informatica feminale / meccanica feminale.

Figures in %; n=77.

Survey results



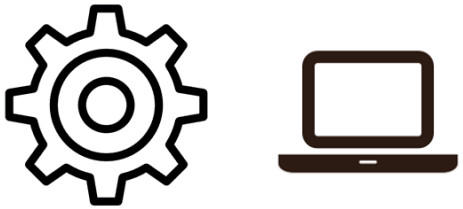
On average **6 participants out of 18** who had said they had considered dropping their studies confirmed that they were motivated by informatica / meccanica to continue.

IF = informatica feminale Baden-Württemberg
MF = meccanica feminale

Survey results

1/3 of drop-out candidates were motivated to continue their studies!

Résumé



- Underrepresentation of women in STEM disciplines in Germany – especially in engineering and computer sciences
- Publicly funded supporting measure: informatica feminale Baden-Württemberg and meccanica feminale
- Survey results: 1/3 of possible drop-outs could be avoided
- Contribution of single-sex educational summer schools to a reduction of drop-out rates of female students

Thank you very much!

Questions? Do not hesitate to contact us at

netzwerk-fit@hs-furtwangen.de

Prof. Dr. Ulrike Busolt, Dr. Karin Ludewig, Susanne Schmidt, Netzwerk F.I.T