IT’S MY CHOICE!
WOMEN IN SCIENCE AND TECHNOLOGY

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Women and men in academia

Proportions of men and women in a typical academic career, students and academic staff, EU-27, 2002–2010

Source: She Figures 2013 European Commission, p.88
The “leaky pipeline”
Women and men in science and engineering

Source: She Figures 2013 European Commission p 89
Interest in STEM studies

Figure 5: Distribution of female students enrolled in higher education, by field of study, world average

Only around 30% of all female students select STEM-related fields in higher education.
110 countries and dependent territories.

Data source: UIS 2014-2016
WHAT ARE THE REASONS FOR THE CHOICE, THE REMAINING OR LEAVING OF A STEM STUDY PROGRAMME?
European Project IRIS
EU 7th Framework Programme – Science in Society Grant Agreement No.: 230043

Interests & Recruitment In Science
Factors influencing recruitment, retention and gender equity in science, technology and mathematics higher education (STEM)

- Coordinated by the University of Oslo
- Partners in 5 European countries: Norway, UK, Italy, Denmark, Slovenia
- Associated partners: Germany, Austria – coordinated by Uni Bremen
The need of a greater STEM workforce

• A competent workforce within the Science, Technology, Engineering and Mathematics (STEM) disciplines is essential in order to meet some of the great challenges of the 21st century: renewable energy, communication, agricultural technology, medical treatments, transport etc. (IRIS consortium 2012)

• STEM is an important sector for economic growth in European countries (EU, 2010).

• Shortage of STEM-educated personnel in Europe and most Western countries → There is a need for greater participation of women in STEM (EU, 2004, 2008; OECD, 2008).
Aims of IRIS

- On what priorities, values and experiences do young people base their educational choice?

- What are the success factors for recruiting more female students to STEM?

- Why do (some) students opt out of STEM education?
European Project IRIS

- Electronic questionnaire
- Target population: first-year students within 8 STEM disciplines defined through the ISCED Classification:
  
  - Biology,
  - Physics,
  - Chemistry,
  - Computer Science,
  - Engineering (mechanical, electronics, computer science)
European Project IRIS

65 items covering

- school science experiences,
- inspiration for choice of education,
- expectations for future job,
- students’ first-year experiences, and
- attitudes to gender equity in STEM.
IRIS in Germany and Austria

- Germany: N = 2236
  - Male: 58%, female 42%
- Austria: N = 1344
  - Male: 50%, female 50%

- Questionnaire survey at the end of the 1st study year
- Qualitative interviews with female students at the beginning and at the end of the 1st study year and at the end of their study programme (N=18)
THEORETICAL FRAME
Expectancy-Value-Model

Expectation of success
- Self efficacy

Subjective value
- Interest and enjoyment value
- Attainment value
- Utility value
- Relative cost

Eccles & Wigfield 2002
Self-Efficacy Theory and Model of Student Retention

Academic integration
- Identity
- Working process
- Workload
- Quality of lectures

Social integration
- Identity
- Working process

Self efficacy
- Efficacy expectation
- Outcome expectation

DECISION

Stay

Leave

Bandura 1997
Tinto 1993
WHICH FACTORS INFLUENCE THE CHOICE OF A STEM STUDY PROGRAMME?
Secondary school is crucial in choosing a STEM study. → interest, previous attainment, practical applications, relevance for society.
Choice process: importance of key persons

How important were the following persons in choosing your course? (% of agree and strong agree; AT = Austria; Ger = Germany)

Key persons are good teachers. For female students family and friends are more important than for males.
HOW DO THE STUDENTS EXPERIENCE THE SITUATION AFTER THE 1ST STUDY YEAR?
Expectancy of success

(% of agree and strong agree; AT = Austria; Ger = Germany)

Expectancy of success: I am confident that I am good enough at the subjects in this course.
Interest and enjoyment

(% of agree and strong agree; AT = Austria; Ger = Germany)

Relative cost
Attainment value
Utility value
Interest in the subject
Expectancy of success

Interest enjoyment value: How interesting is the content of the course?
The overall experience of being a student in this programme

(\% of agree and strong agree; AT = Austria; Ger = Germany)

Utility value: I can see the relevance for what I learn.
Attainment value: I feel that the course fits the person that I am.
Cost
(% of agree to “Better than expected”; AT = Austria; Ger = Germany)

Relative cost: The effort you have to spend on your study.
Retention: Was the study choice the right decision?

- Most of the students are sure that they have chosen to study properly.
- Women are less sure about choosing the right study than men.
Social: “Your social relationship with your fellow students.”
(% of “Better than expected” 3-point-Likert scale; AT = Austria; Ger = Germany)

“Generally a good social life.” Females recognize/value that more than males.
Academic: “Your integration in research groups and academia.”
(% of “Better than expected” 3-point-Likert scale; AT = Austria; Ger = Germany)

“Generally sufficient.” Females recognize/value the academic integration more than males.
Opt out: Are the students thinking about giving up their studies?

- 22.8% of the female students consider giving up their studies.
- 14.7% of the male students consider giving up their studies.
- Statistically highly significant relationship between Gender and study dropout ($p = 0.001$ **).
Preventing drop out ............

Show that students are part of the social and scientific community – make them confident that they can succeed!
Preventing drop out..........................

Make it clear that STEM studies are hard and demanding; assure them that they will get support.
Summing up

The experiences in secondary school is important in choosing a STEM study

Key persons: good teachers

Key factor: interest towards the subject
Implications for supporting first-year students and preventing drop out

- Let students understand that STEM education is interesting and meaningful for their future life.
- Let students understand that STEM education will be a possibility to realize the own potential.
- Strengthen self efficacy; reduce the impact of perceived cost.
- Support students by their social and academic integration.
- Support mentoring systems esp. for female students.
Thank you for listening.

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References

- EU, (2013): She Figures 2012 - Gender in Research and Innovation, Brussels