GENDER AND SCIENCE EDUCATION

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- Facts and figures**:** The ‘big picture’- findings drawn from recent EUROSTAT data (30.06.2011) and European Commission ‘She figures 2009’ booklet.
- Why gender matters in the study fields of **‘science, mathematics and computing’** and **‘engineering, manufacturing and construction’**?
- Identification of the problem: Why female students do not opt for studies in S&T areas at the tertiary level of education (ISCED 5&6) and related with them career trajectory?
- Examination of reasons behind the problem: findings from several on-going and completed research-oriented large-scale international projects as well as from several EU, UNESCO and UN reports.
- Policy of gender equality in education.

Facts and figures: The 'big picture'- findings drawn from recent EUROSTAT data (30.06.2011) and European Commission 'She figures 2009' booklet

In 2009 within EU-27 the number of women graduates from tertiary education was about 60% out of the total.

- *social science, business and law* - 61.8%
- *science, mathematics and computing* - 40%
- *engineering, manufacturing and construction*- 26%

Female students are concentrated in *'education and training'* and *'humanities and arts'* *'social science, business and law'*

PhD graduates: 45%, 41% and 25% respectively.

There are stable *gendered patterns* and persistent *horizontal segregation* at ISCED 5&6 level of education.

Distribution of graduates among the different study fields

- *Social science, business and law* - **35.6%** (relative share of the total tertiary student graduates at ISCED 5&6 for 2009); Stable trend for this field of study during the five-year period 2005-2009

- *Science, mathematics and computing* - **9.2%** (relative share of the total tertiary student graduates at ISCED 5&6 for 2009); Trend: from 10.0% in 2005 to 9.2% in 2009

- *Engineering, manufacturing and construction'* - **12.9%** (relative share of the total tertiary student graduates at ISCED 5&6 for 2009); Trend: from 12.7% in 2005 up to 12.9% in 2009

Why gender matters in the study fields of ***'science, mathematics and computing'*** and ***'engineering, manufacturing and construction'***?

- Enlarge the available pool of highly qualified human resources potential in the two areas
- Enrich the research in S&T areas with a different perspective
- Elaborate gender-friendly user-driven products and services
- Empower women life chances
- Enable women for making *informed decisions* in all paths of their lives
- Foster the emergence of a **critical mass of women** in S&T areas, which is of crucial importance for the next generation of students' subject choice of studies

Why female students do not opt for studies in S&T areas at the tertiary level of education (ISCED 5&6) and related with them career trajectory? (identification of the problem)

- According to many well documented studies female and male students make a definite choice of the subject of their studies already in 15-16 years old.
- Gender differences in the **subject choice & performance** during the upper secondary education predetermine and cause the gender imbalance in the tertiary education two broad fields of study.
- The OECD's **Programme for International Student Assessment (PISA**) explores the educational performance and attitudes of 15-year-old girls and boys.

Some findings of PISA 2006

- PISA 2006 reported that overall gender differences were the smallest in science when compared to reading and mathematics. …on average there was no gender gap [in science domain of assessment] in most countries. Females had higher results in Bulgaria, Greece, Latvia, Lithuania, Slovenia and Turkey, while males scored higher in Denmark, Luxembourg, the Netherlands and the United Kingdom (England).
- However, despite performing equally as well as boys in most countries, girls tend to have lower self-concept than males in science i.e., on average, girls had lower levels of belief in their scientific abilities than boys in all European countries.
- As PISA 2006 focused on science, it reported other interesting issues. On average females were stronger in *identifying scientific issues*, while males were stronger at *explaining phenomena scientifically'.*

Redefinition of the problem

Why do girls and young women of 15-16-years old not identify with mathematics, science and technology subjects and related careers, despite the fact that they perform equally in science domain of assessment?

Examination of reasons behind the problem: findings from several research-oriented large-scale international projects as well as from several EU, UNESCO and UN reports

- **ROSE project:** The Relevance of Science Education; ROSE study – initiated by Norway in 2001 and conducted in England in 2003, sought the views of 15 year-olds from 40 countries to map out attitudinal or affective perspectives that underpin student career choices (Schreiner and Sjoberg, 2007).

- **IRIS project:** Interests & Recruitment in Science. Factors influencing recruitment, retention and gender equity in science, technology and mathematics higher education. IRIS addresses the challenge that few young people, women in particular choose education and career in science, technology and mathematics (STM).

- **HELENA project:** Higher Education Leading to ENgineering And scientific careers.

- **IFAC project:** Information for a Choice. Empowering Young Women through Learning for Technical Professions and Science Career.

- **WOMENG:** Creating Cultures of Success for Women Engineers.

- **PRAGES project** : Practising Gender Equality in Science.

Key findings: Accumulation of different causal factors

- Gender stereotypes which operate at different levels like: society, family, education's institutions, media, etc.

- The absence of female scientists/engineers role models in general, and in particular - the absence at the level of upper secondary education of professional counseling and guidance, mentoring programs, etc.

- An outdated pedagogy in terms of the way science is taught in schools and the irrelevance of science curriculum to students' interest, in particular to girls' interests.

What kind of science curriculum might attract girls' interest in the subject?

- If it includes social elements and discuss the relevance of the subject to society, i.e. its *social relevance*, for example the benefits of S&T for society;

- If it shows the human dimension of science's endeavor. A historical review of some great debates in science and scientific discoveries reveals a kind of *personal relevance* – instead of the stereotyped 'abstract, cold and depersonalized' image of science appears a more human image of science, which is full of passion, struggle for recognition and other human qualities. Therefore if science curriculum includes a bit of history of science illuminating what is going behind the 'scene of science' it might attract students' interest in the subject;

- If it is cross-disciplinary and multidisciplinary (especially at the tertiary level of education).

Policy of gender equality in education

- There is no standardised system of data collection (indicators) on gender equality in education across Europe.
- The EU policy on gender equality in education is strongly focused on equalizing female and male participation in the broad fields of studies: *science, mathematics and computing* and *engineering, manufacturing and construction* without taking into account the respective *national context* (socio-economic and cultural) of different countries.
- The United Nations Division for the Advancement of Women (DAW, now part of UN Women) in collaboration with the United Nations Educational, Scientific and Cultural Organization (UNESCO) convened an expert group meeting (EGM) on **'Gender, science and technology'** from 28 September to 1 October 2010 in Paris, France. Details are available at: http://www.un.org/womenwatch/daw/egm/gst_2010/index.html
- The Expert Group produced a Report. Its first part deals with **'Women's and girls' participation in S&T education and employment'.** The Final EGM Report is available at: http://www.un.org/womenwatch/daw/egm/gst_2010/Final-Report-EGM-ST.pdf

Thank you for your attention!