93. Why should I choose a STEM PhD?

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Introduction

This paper highlights some results on the priorities and considerations that determine the process of choosing to become a STEM PhD student in Slovenia. The research reported in this paper has been undertaken within the IRIS project, which is funded by the European Community under the Seventh Framework Programme (Grant Agreement No. 230043). The focus of IRIS is on disciplines that are challenged by low recruitment and low female participation. Research shows that women in general have lower self-efficacy and perceive a higher cost associated with studying STEM; they identify less closely with the STEM disciplines and the scientists associated with them; women have different interests (IRIS, 2010).

This study therefore had two main objectives: (a) to identify which priorities male and female PhD STEM students in Slovenia have for their future careers, and (2) to identify different important factors that influenced their choice of studying a STEM PhD. The detailed analysis is still work in progress and the final results will be presented in the future.

Theoretical background and international statistics

According to international statistical data (Global Education Digest, 2010) “the largest level of gender imbalance exists in the engineering, manufacturing and construction field of study with 36% of female PhD graduates, although in North America and Western Europe as well as Central and Eastern Europe, women outnumber men significantly among both the Bachelor’s and Master’s degree graduates in general across other fields of study”. The statistics confirm (Education in Europe, 2008) that “in all countries, women easily outnumber men graduating in the fields of education, humanities and arts, social sciences, business and law and health and welfare. Male graduates prevail in the fields of science, mathematics and engineering, manufacturing and construction where only 32% of women graduates at the tertiary level of education (ISCED 5 and 6)”.

The gender imbalance in Slovenia is very similar to international statistics mentioned above; 65% of men and 35% women are studying natural sciences, mathematics and computer science and technology and construction in Slovenia.

Social influences

Students from young age (and males in particular) often hold stereotypical views about STEM topics and activities as a typical male thing to do (Greenfield, 1996, 1997; Jones, Howe & Rua, 2000), also in the Slovenian context (Dolinšek, 2008). Young people, females in particular, often perceive science as difficult, uninteresting, unimportant, passionless, boring, or leading...
to an unattractive lifestyle (Jones et al. 2000; Eccles, 2009) and their overall interest in science starts to decline after elementary school (Brotman & Moore, 2008).

Moreover, many females believe that the research careers are incompatible with having a family life, which often means they believe they would need to change their personalities to be successful in those careers (Grunert and Bodner, 2011). The concept of science identity is based on how students view themselves and believe others view them as they participate in the scientific endeavours, hence the student’s science identity likely changes and evolves over time (Aschaber, Li and Roth, 2009).

Methodology and research questions

The main data collection method was done on the basis of electronic IRIS PHD Questionnaire (called the IRIS PHD Q). Different constructs from the Eccles expectancy-value model of achievement-related choices (Eccles et al. 1983) are implemented in the IRIS PHD Q, concentrating on the expectation of success and subjective task value. According to the Eccles model the motivation for an educational choice consists of these two main aspects: the student’s expectation of success and the subjective task value he or she attributes to the educational options available. Subjective task value consists of interest-enjoyment value, attainment value, utility value, and relative cost. Possible scores ranged from 1 to 5, with higher scores indicating greater importance. Standard deviations are indicated in parentheses. Gender difference was tested using the repeated-measures analysis of variance (ANOVA).

The questionnaire was completed by PhD STEM students from the University of Ljubljana that represents the majority population of PhD students. The following five STEM faculties participated in the study: Biotechnical faculty, Faculty of Electrical Engineering, Faculty of Chemistry and Chemical Technology, Faculty of Computer and Information Science and Faculty of Mechanical engineering. The target population included all PhD students on study programmes at University of Ljubljana according to the International Standard Classification of Education (ISCED) codes (Figure 1). The sample consisted of 192 doctoral students, 135 male and 57 female students, which represents 32.2% of the whole target population.

Figure 1: response rate of PhD students enrolled in STEM studies at University of Ljubljana in 2010/11.
**Results and research questions**

The study did not identify ethnic, religious or social background of respondents. Following the background information (gender, year of birth, university, PhD programme, previous enrolments) the questionnaire provided quantitative measures of:

1. importance of age period when they developed the interest for PhD study
2. importance of the key persons in choosing the course of study;
3. importance of different priorities for their future careers and importance of characteristics of a career development
4. importance and impact of PhD study on personal life

We will briefly present the most relevant results but focusing on the career priorities and characteristics.

The results showed that the age period 19-27 is the most important for developing interest in research and academics (STEM) identity for both males and females. The key person with the greatest influence on students was the professor/mentor for both, males and females.

Several studies (e.g. Cerinšek et al., 2012) have demonstrated that females tend to seek more interpersonal values in their future careers, such as helping other people, contributing to the society and protecting the environment, whereas males place more value on extrinsic rewards, such as earning high income. Female PhD STEM students in Slovenia seem to have different, more inter-personal career priorities than male PhD STEM students, i.e. they want more than males to work at occupations that allow helping other people, contributing to the society and protecting the environment.

**Conclusion**

We need to be aware that the gender imbalance within STEM starts at the undergraduate level of study. Regarding the role of the media, the IRIS study on undergraduate STEM students showed (Cerinšek et al., 2012) that among different out-of-school school experiences that were listed, all respondents rated “Popular science television channels / programmes” as most important factor influencing their choice of STEM studies, followed by “Popular science books and magazines” and “Museum/science centres”. It is therefore important to notice, that the lack of proper representation of the female scientists’ role models in the media might create or affirm the stereotypical beliefs about female scientist in general and even add to female disinterest in STEM studies or in other case, encourage them to consider the possibility to enroll in STEM studies and consequently STEM PhD.

**Literature**


