



2nd International Conference on Higher Education Advances, HEAd'16, 21-23 June 2016,
València, Spain

Career Choice of Undergraduate Engineering Students

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Abstract

Choosing engineering as a profession has traditionally not been a top priority among women. Based on the theory of planned behavior (TPB), choice is contingent upon attitudes, subjective norms, and perceived behavioral control, all of which influence behavior. Our research aimed at determining whether the frequencies of these three factors are the same or different among women and men choosing engineering careers. We examined the set of three TPB factors for 330 undergraduate engineering students majoring in information and systems engineering and computer science. We asked the students what had led them to choose a future engineering career. Analyzing each response for recurring TPB factors and sub-factors, which were identified and validated, we found that undergraduate female students who did not express the attitudes factor in their statements are influenced by the subjective norm factor more than men. At a higher resolution, women are significantly more influenced than men by other people. Our study contributes to advancing our understanding about gender-dependent career choice by exploring factors and sub-factors that expand on TPB. These factors and sub-factors can serve researchers interested in developing tools for encouraging women to choose and retain STEM careers.

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Peer-review under responsibility of the organizing committee of HEAd'16

Keywords: Engineering; Gender; Career choice; Attitudes; Norm; Perceived behavioral control

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1. Subject and Problem Statement

Increasing demand for science, technology, engineering, and mathematics (STEM) careers in the labor market is in contrast to the lack of undergraduate students who pursue careers in these areas (NAS, 2010; NRC, 2012). This shortage is due to the decline of interest in and choice of STEM domains in both higher education and industry (Xie & Achen 2009; Riegle-Crumb et al. 2011). In particular, women have shown decreased interest in STEM careers, and subsequently, fewer women enter STEM careers (Hazari et al. 2010; Sadler et al. 2012). In our country, the proportion of women who choose to study engineering at the undergraduate level is below 15% (CBS data, 2012). Women tend to complete degrees in the humanities, social professions, education, and health, while men are more inclined towards professions in mathematics, science, and engineering (Sikora & Pokropek, 2012). Carlone et al. (2015) show that girls were more concerned with figuring out "what kind of girl to be" and less engaged with how to become "scientific". The phenomenon of referring or guiding students to specific domains is based on a stereotyped concept of the division of responsibilities between men and women. Although there have been many positive changes in the status of women in higher education and employment, some professions are still perceived as "manly" (Zohar & Sela, 2003; Teshner, 2014). Thus, in order to ensure the integration into and retention of women in STEM careers in general and engineering career in particular, it is necessary to tackle the decline of interest in, and choice of STEM disciplines, and especially of engineering, amongst women pursuing higher education.

2. The Theory of Planned Behaviour

In his theory of planned behaviour (TPB), Ajzen (1986; 1991) claimed that interest and choice is a result of decision-making processes, which depend on motivation as reflected in the intention to choose to engage or not engage in a behaviour. In this process, attitudes, subjective norms, and perceived behavioural control are considered motivational factors. These factors, when combined together, influence one's choices and behaviours. The degree to which a person displays a positive or negative evaluation towards performing a particular behaviour is considered one's attitude. A subjective norm is a social factor that refers to the perceived social pressure to perform or avoid performing a particular behaviour. Subjective norms represent extrinsic motivation (Ajzen 1986; 1991). An individual's perception about his/her particular behaviour is influenced by the judgment of significant others, such as parents, spouses, friends, and teachers (Amjad & Wood, 2009). Finally, perceived behavioural control refers to one's perception of his/her own ability to perform a behavior based on his/her past experiences, as well as on anticipated challenges and obstacles.

3. Women's career paths

Career trajectories differ between men and women (Liff & Ward, 2001); a woman's trajectory tends to be more influence by pre-defined societal roles, relationships, and responsibilities. Traditionally, a woman's role in society has been defined by husband's career(s), bearing and raising children, and caring for elderly family members; as such women are traditionally regarded as primary care-givers. Given these social assumption about women's roles, women are more likely to experience career disruptions due to these and other family responsibilities (Ackah & Heaton, 2004). Women's careers are also shaped by the male work culture (Liff & Ward, 2001). Some male-held stereotypes, such as the preconception of women's roles and abilities (Metz, 2005; Clarke, 2011), lack of ability to obtain mentoring, relative under-representation of women in higher level positions in organizations (Burke et al, 2005), and failure of senior management to take responsibility for women's promotions (Lyness & Thompson, 2000) are factors that impact a woman's career progress (Lyness & Thompson, 2000).

4. Role models

Role models are individuals that people want to follow or imitate, based on their attitudes, qualities, and choices (Shapiro et al, 1978). Metz (2005) and Craighead and Nemeroff, (2004) referred to four modeling stages: observation, interpretation, motivation, and performance. For decades, the use of role models has been proposed as a potentially powerful technique to influence more talented young women to pursue science-related careers.

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