Chapter 65

Engineering Education for All:
Increasing Access to Engineering Education for Men and Women Across the World Through Distance Learning

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ABSTRACT

For many men and women across the world, distance education has improved access to higher education. Distance education could potentially help bridge the gap that divides the East and the West. A group of highly motivated young men and women from the Middle-East with undergraduate degrees in electrical engineering, computer engineering, and computer science students were given an opportunity to earn a Ph.D. degree from a high ranking American university. These highly motivated men and women then were asked to participate in an online survey that aimed at comparing their perception of online education versus face-to-face education. The result indicated that there was no association between the students' degree of self-efficacy and feeling of inclusion in online versus face-to-face courses. Moreover, the result indicated that there was no association between gender and self-efficacy regardless of the medium of the choice.

INTRODUCTION

The fast-growing distance education (DE) is becoming one of the most prominent movements in higher education (Allen & Seaman, 2010; Deming, Golden, Katz, Yutchman, 2015; Watson, Pape, Murin, Gemin, & Vashaw, 2014). According to, Iglesias, Moreno, Castro, and Cuadra, (2014), approximately 6.1 million students are enrolled in online courses. Perhaps the most known online education initiative is Massive open online courses (MOOCs). MOOC courses have offered outstanding education to a great number of students around the globe for a negligible, or no fees. MOOC courses have gained immense popularity over the last decade. Similarly, online courses have provided opportunity to millions of disadvantaged populations, crossing the barriers of location, gender, race and social status; by making education avail-

able to all (Aboshady, et al., 2015). Online courses offer opportunities to students across the world to enroll in reputable institutions and obtain internationally accredited degrees. Online courses are often most appealing to nontraditional students with existing professional or family obligations (Bunn & Wake, 2015; Turner, 2007). Moreover, international students with limited financial resources who aspire to obtain a degree from respectable institutions could easily benefit from online degrees.

Many researchers and policymakers across the world put a great emphasis on creating a culture of tolerates to complete participation of all cultures in engineering and technical fields (e.g., InterAcademy Council, 2006). The council further emphasized that industrial countries should build a worldwide training capacities for science and technology for all cultures and all genders. Despite this understanding, to date, research in this area has been limited. The fast-growing movement toward online education has the potential to bridge the cultural gap and level the imbalance in access to higher education to both male and female in developing countries. It is particularly important to understand students' perception of online education in countries with more challenging cultures toward their female populations such as Middle Eastern countries. Identifying alternative venues for STEM degrees for these populations is important. Information about how engineering students in developing countries perceive such courses is still limited. Such investigation is important, especially in politically unstable countries in the Middle east where high-quality education is often scarce (Aboshady, et al., 2015).

This preliminary case study focuses on Egyptian engineering PhD students'—enrolled in a distinct hybrid program—perception of self-efficacy and feeling of inclusion. In 2005 USAID facilitated a partnership between an American university and an Egyptian university to develop a unique opportunity for Egyptian Electrical Engineering, Computer Engineering, and Computer Science students to obtain a terminal degree through a hybrid education offered by these two institutions. To our knowledge, there are no available studies that have investigated similar partnership programs. This study will aim to answer the following research questions:

1. How does a highly educated group of Egyptian engineering Ph.D. students perceive self-efficacy and feeling of inclusion in online versus FTF environment?
2. Is there any association between gender and perception of comfort level in engineering distance education classroom for this group of students?

In this article, the word "comfort level" will frequently replace self-efficacy and feeling of inclusion. Despite the small sample size, it is important to understand the students' perception of online education in this unique partnership. Moreover, considering women's underrepresentation in science, technology, engineering, and math (STEM), it is vital to identify alternative educational settings in which women could take STEM courses and feel the same level of comfort as their male classmates. Although, in statistical inferences large samples are always better and more precise—narrower confidence intervals with superior reliability—the reality is that researchers are most often faced with circumstances that limits their access to large sample sizes (Ioannidis, 2013; de Winter, 2013). These limiting conditions could be budgetary issues, time, ethical reasons, and/or small population—the case for this study. In some fields of studies such as study of rare animal species, rare diseases, or study of savants, researchers' work are always limited to small sample sizes (de Winter, 2013). Small sample sizes should not be the reason for halting a research in any field of study (de Winter). However, the reader is advised to view the results of this study as preliminary and as a case study based on the small population and the sample size (N = 25).

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