An international perspective on Women in Engineering

Diversity is crucial to innovation and creativity in engineering fields, where different perspectives and fresh viewpoints are invaluable. Nowhere is this more evident than in the area of gender diversity.

Currently, women make up an estimated 16.5% of the global engineering workforce [1]. Globally, women make up 28% of the engineering graduates [1]. However, as we delve into international perspectives of women in engineering, we uncover a wide range of different situations and viewpoints across different cultures. While engineering representation for women is generally low across the globe, there are many countries with higher representation from which we can learn. These anomalies challenge us to delve deeper, uncovering the intersections of culture, economic status, and access to education that shape career trajectories.

The global lessons– Western viewpoint

While countries have varying degrees of women representations in engineering, western societies like Australia, the UK and the US have shown similar statistics. Currently, 23.2 per cent of engineering graduates in Australia are women [2],while the percentage in the workforce may be as low as 13% [3]. UNESCO found similar numbers in the UK and USA, with women comprising 23.5 per cent and 20.4 per cent of the engineering cohort respectively. Similarly, women constitute 14.5% of the UK engineering workforce [4], and 15.9% of the ones in the US [5]. The similar figures in Australia, the US and the UK could be due to similarities in culture, such as acceptance of men in technical roles and women in caring roles, including teaching and nursing, as well as similarities in STEMM teaching quality at a higher education level. However, these figures are lagging behind many countries across the globe, with some of them being of lower socioeconomic status and gender equality indexes. What can we learn from these countries?

The global lessons– Socio economic status

Counterintuitively, many of the highest women-representation in engineering statistics come from developing countries with emerging socio economic developments. For example, Lithuania, Latvia, Oman and Malaysia all have above 50% of women in engineering [6]. The highest proportion of female engineering graduates is Benin at 54.6 percent, followed by Brunei Darussalam at 52.3 percent [2]. This inclination might stem from the lucrative nature of engineering degrees, appealing particularly to those from lower socioeconomic backgrounds for financial reasons. A developing country with lower socioeconomic status may have a more utilitarian culture that puts less emphasis on passion for a career and more emphasis on financial stability.

In India, where women make up 48% of the engineering sector, one female engineer expressed that *“A STEMM career is viewed as a way to guarantee financial stability and upward mobility on the socioeconomic ladder which incentivises everyone, including women, to get into a STEMM field”*. [2] The significant portion of women present in the engineering workforce in turn fosters a culture where engineering is not seen as male dominated, and women get represented in higher management too. When looking at the broader STEMM field, Georgia, Cambodia and the Dominican Republic all have more than 50 percent of roles filled by women, being top of the globe [7]. Some have speculated that this could also be due to them quickly developing new technologies in emerging fields where there are less gendered stereotypes against women [7].

The global lessons– Government initiatives

Many of the high percentages of women in engineering statistics are results from strenuous efforts from government or other organisations that promote engineering for girls and women. For example, Bulgaria has the highest proportion of female computing specialists in Europe with 28% women, followed closely by Lithuania and Romania [8]. In Bulgaria, the government put huge emphasis on making the country a global technology leader in the 70s and 80s, attractive for both men and women, resulting in gender equality at the workplace [8]. In Oman, the government has made considerable efforts to promote the subject among women [8]. This is paired with the efforts of organisations such as Society of Women Engineers (SWE), dedicated to increasing women's participation throughout multiple engineering fields through offering educational opportunities and scholarships [9]. There are a range of similar organisations across the globe, for example, notable organisations such as Women in Technology International (WITI) and TechWomen in the US are providing mentorship, networking, and advocacy platforms for women engineers to thrive [10].

Global lessons– Defying gender stereotypes

Interestingly, many countries with higher women in engineering participation rate are commonly seen as less gender-equal. Some of these countries face cultural shifts amongst women, for example, the eagerness to go into engineering is part of an awakening among Middle Eastern women, to defy that engineering is a man's job [11]. It is worth pointing out that a controversial study suggested that gender equality may in fact be detrimental to increasing the number of women in STEM [11]. It is speculated that gender equality leads to more welfare for women and therefore more freedom to choose non stem degrees, and follow one's passion [12]. One might question the effect of freedom to pursue one's dream in the west. For young girls in western countries who hear the idea of following your passion, they may in fact be more susceptible to gender stereotypes due to their identity becoming tied to people in careers who look like them, in the pursuit of individualism and free choice [12]. A similar idea is raised for the freedom to choose high school classes, where many girls who are otherwise good at STEM drop out of maths or science due to gendered influences [11]. A lesson we might learn from this is that it is crucial to increase role models working in STEM and lessen gendered stereotypes for young girls.

Global lessons– Historical and cultural reasons

Many countries have historical reasons that shape their current women in engineering situations. In Japan, the acknowledgment of women as integral members of the workforce didn't occur until 1986, a reflection of the considerable influence of a community-specific patriarchal system and its unyielding nature [13]. In contrast, Malaysia, a country with a progressive history of gender equality since the sixteenth and seventeenth centuries, resulted in women being socially better positioned compared to other parts of Asia [13]. Being influenced by historical trends, many countries are slow in cultural shifts, which may put them behind on encouraging women to pursue STEM degrees.

In conclusion, there are many things we can learn from the global engineering workforce. In general, it seems the participation of women in engineering is heavily shaped by cultural factors and gender stereotypes. However, the outlook is promising as university enrollments continue to rise globally, and global women engineering representation has increased from 10 to 16 percent since 2010 [1].

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