

LOW LEVEL OF PARTICIPATION OF WOMEN IN ENGINEERING AND TECHNOLOGY: CAUSES AND SOLUTIONS

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ABSTRACT

The engineering profession has always from the time past seen as a ‘man’s profession’. This can be because of the much physical activities required in the early engineering days when machines were in minimal use, as a result, women seen as the ‘weaker vessel’ do not want to venture into the field even though most of them have the intellectual capacity to excel in the field. The move by most countries over the centuries from Energy-based economy to Knowledge-based economy has resulted in the clamor for gender equality in the workforce of a nation. This paper tends to critically look at the causes of low level of participation of women in Engineering and Technology and also the solutions to address these causes. Literatures were reviewed and results shows that Gender stereotype, few women role model and self-doubt are the main opposition to women participation in engineering. Findings were tabulated for easy comprehension. At the end suggestions were made regarding the solutions to solve this problem.

Key words: Energy-based Economy, Knowledge-based Economy, Engineering, Technology.

1. INTRODUCTION

There has been increased clamor for an improvement in the number of women in Science Technology Engineering and Mathematics (STEM). The step taken has resulted in the increase of women in STEM but even with the increase, gender disparity is still more pronounced in the STEM fields particularly in the Technology and Engineering fields (Okorafor, Kakiri and Okorafor, 2015; Susan, 2016). Over the years, the ratio of boys to girls admitted in Engineering and technology in Federal polytechnic Ilaro (FPI), Ogun State Nigeria has been low. This problem is not peculiar to FPI alone but cuts across the institution of higher learning in Nigeria, Africa and the World at large. It is noted that 15.1% of engineering undergraduates in the UK in 2017 are women (Sarah, 2018). This low Enrollment of women in tertiary institutions also reflects in the workforce, hence the “Leaky Pipeline” Metaphor: Consequently, a leak at one stage of the pipeline logically accounts for the shortage in later stages (Badrul and Rohani, 2015). A 2017 survey shows that 11% of the engineering workforce is female (Sarah, 2018).

Engineering mainly seen as a man’s occupation has been experiencing over the years mass exodus of females who have an engineering degree to other non-engineering related field. Fewer females are likely to enter a career in technology, engineering and physical sciences while more are likely to exit those career environments (Rebecca, Aruquia, Ito, and Maria, 2018). It has been reported that an estimated 40% of women leave the engineering practice (Rebecca, 2014). Also engineering related subjects like Computer Programming which was initially occupied majorly by females has been over taken by men. As (Uyinomen and Chiemeke, 2015) rightly puts it “though women were the programmers of ENIAC, America’s first electronic computer, today they are dramatically under-represented in Information Technology fields”.

Most of the world has moved from an economy that is energy-based to knowledge base, it is therefore desirable to obtain a better gender balance within Engineering discipline especially in developing countries like Nigeria as Science Technology Engineering and Mathematics (STEM) Education can be seen as the determining factors of a country’s intellectual ability and strength which catalysis improvement in scientific research and industrialization for effective and robust economy (Roseline and Azuka, 2016). Establishments are more likely to improve performance by 15% if the organizations are more gender balanced (Rebecca et al, 2018). The underrepresentation of women in hard sciences such as Engineering and computer technology will create a narrow-focused industry and as Dr. Omobola said in an article published by (Titilola, 2018) that “a narrow-focused industry will not address the issues of humanity as it should”. A country that neglects the provision of good quality science education will find itself to be a dumping ground of other people’s innovations (Roseline & Azuka, 2016).

The wide gap in Engineering is as a result of Economic, Political and socio-cultural factors (Carolina and Bárbara, 2018). Women because of childbirth and family engagements has resulted in them partially/ (or not) practicing engineering (Uyinomen and Chiemeké, 2015; Liza and Sarah, 2014). Considering the under-representation of women in Engineering, it is disappointing not to see more attention given in the literature to explore the reasons for this gender imbalance (Liza and Sarah, 2014). Steps on how to attract, encourage and keep the females in Engineering is crucial if we want to obtain a better gender balance to address the ‘leaky pipeline’ within the Engineering discipline. In the light of this, this quote *“I do belong here [in engineering]. I will graduate as a woman engineer and when I go out into the world I will kick ass . . . But the difference between women and men in engineering is that while men are all for themselves, we women know that what we do today directly impacts the women engineers of tomorrow, and so I’m not just one woman—I am all women ”* gotten from a student (Tylor) in study by (Carroll , Susan , Erin, and Brian , 2018.) should serve as a motivating factor for women to engage and stay put in Engineering.

2. LITERATURE REVIEW

Despite the achievement of women like Funke Opeke, Dr. Omobola Johnson, and so many others more in STEM related careers, which is supposed to be a motivating factor. Women are still underrepresented in this field. The causes identified were: poor visibility in sciences and technology based subjects, family engagements, Educational stakeholders having a negative perception that science and technology is more important to boys than to girls, and poor self motivation. They opined that more women can be attracted to the field of science and technology through the use of ICT especially through blogs (Raimi, Shokunbi, and Peluola, 2015).

(Carolina and Bárbara, 2018) stated that women constitute 28.8% of the worldwide science researchers. They identified low participation of women in engineering discipline. Social stereotype, academic career distinction, job positions and salary gap as the factors causing this low participation. To tackle this issue, they postulated that parents, schools play a vital role in addressing it.

(Liza and Sarah, 2014) identified low level of women in top levels of Academic institution. The absence of women at the top tier results in negative influence to the women aspiring for a name in STEM and discrimination of women during recruitment process.

Females exploitation by male lecturers in SMT education, Professional gender labeling, Peer group influence, Family background are the barriers identified by (Iwu and Azoro, 2017) in their study to ascertain the barriers causing low participation of women in science, mathematics and technology. The solutions gotten to tackle the problems were as follows: Using successful females of SMT education as resource persons during career day in schools will increase participation of females in SMT, Scholarships to females in SMT education will increase participation of females in SMT, A pragmatic approach such as the use of 21st century teaching strategies in the teaching of SMT in schools will increase participation of females in SMT.

3. STAGES TO ENCOURAGE MORE PARTICIPATION OF WOMEN IN ENGINEERING

From the reviews, to kindle the light of Engineering and technology in females should start from childhood down to till the workplace. This is shown below at the following places:

Home

Breaking down social stereotypes: there should not be a ‘boy toy’ or ‘girl toy’. The ‘boy toys’ like computer game, trucks, robots and so on has a way of kindling interest in science and engineering. Female kids should be allowed to play with toys that can stimulate engineering curiosity in them. Parents should also promote girl’s scientific curiosity by engaging them in extracurricular activities involving STEM topics.

Primary school

Introduction of STEM subjects early in a student’s life, frequent sensitization of parents and teachers of primary school students emphasizing capability in the choice of career to address gender bias (Roseline & Azuka ,2016).Getting girls comfortable in STEM subjects at tender ages will inform their decisions to either pursue careers in tech or build tech enabled businesses (Titilola, 2018). It was observed that tutors normally have much interest in teaching STEM subjects

like mathematics, Physics, Chemistry to boys than to girls in believe that those courses are meant for boys. This should not be the case as research has shown that girls do perform well, sometimes more than the males in STEM subjects.

Secondary school

Secondary school is the foundation for the choice of careers for students, yet, there is little research on gender valuation of science and technology among secondary school students in Nigeria (Roseline & Azuka, 2016). According to them a training program in science related subjects at the junior secondary school level will help achieve gender equality in science and technology.

Tertiary institutions

It is observed that most female Engineers look for another career unrelated to Engineering after graduation. Therefore more female tutors should be employed in the tertiary institutions to serve as a direct guide and motivators to female students. This will ensure they will continue in their career path after they have graduated.

Work place

Women at all levels especially at the top tier should be visible. This will serve as a motivation to younger girls who will like a career in Engineering. Also more women at top tier will ensure lower gender discrimination against women during recruitment process.

It is shows that women are disliked when they are successful in jobs that, based on gender stereotypes, are just for men. For this situation, the author encourages women to continue doing work with high levels of competence independently of the negative social responses.

General

More initiatives by countries and organization to Encourage women in Engineering should be implemented. These initiatives like establishment of February 11th as The International Day of Women and Girls in Science by the resolution A/RES/70/212 from the United Nations, Women in Technical Education and Employment (WITED) in Nigeria, should try to increase the visibility of successful scientific women that would, by this increased visibility, become role models to stimulate girls to follow scientific and Engineering careers and to reach leadership roles..

Initiatives like the Athena Swan Charter launched in 2005 which recognizes the commitment made by higher education institutions to advancing and promoting women's careers in science, technology, engineering, mathematics and medicine (STEMM) in the UK (Liza and Sarah, 2014). This initiative has encouraged more women in STEM education. An initiative tailored specifically for Women's participation Engineering and technology will close to a reasonable extent the gender gap being experienced in Engineering profession worldwide.

Table 3.1: Barriers and solution to women participation in Engineering and Technology.

Barriers	Solution
Lack of sponsorship	Availing Special Scholarships for only females studying Engineering at any educational level.
Few female role models (invisibility)	Women should be more visible and always turnout in Engineering and technology gatherings. They should also aim to attain top positions in organizational management to curtail unconscious bias during recruitment process.
Few Female teachers in Engineering	Employ more female Engineering Educators in the Tertiary institution whom will also act as counselors to the female undergraduates.
Gender Stereotype	No 'boy toy' or 'girl toy' at home. Every child should be allowed to play with whatever it wants. The idea that men performs better than women in engineering is false, research has made it known. Making this knowledge known will address the salary gap and decrease conscious and unconscious bias.
Insufficient initiatives	Introducing more programs like the WITTED by government, organizations.

4. CONCLUSION

Engineering and Technology involve many STEM subjects that are essential in developing our mind for critical thinking and problem solving ability. The low level of participation of women in Engineering and technology especially in developing nations is tantamount to a one-legged man walking towards technological advancement, which will make development slow. Having more women in Engineering means having more workforce and required skill sets needed in engineering discipline for rapid national development. Therefore steps have to be taken to make Engineering appealing to women. These steps should start immediately from childhood (home) down to tertiary level, and after they have gotten the degree encourage them not to divert to other discipline but to practice engineering effectively.

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