

Advancing Women's Career in The Sciences for Sustainable Development

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Abstract

Women hold a prominent position in society. Demographically, the population of women is almost the same as that of men; hence men and women should be at par in development. However, this is not the situation. Women have been discriminated against on many fronts and their full potentials have not been harnessed for human development. This paper examines the numerous factors militating against women and girls, the impact of their inability to contribute maximally to sustainable development and proffers solutions to the problems. Some of the factors responsible for women's low performance include poor self-motivation, lack of access to education and funds, lack of mentors and role models, gender bias and discrimination. Despite these challenges, some women have been able to break through these stiff barriers to excel and impact the world positively in the field of science and allied fields. This indicates that lethargy is not acceptable, and that where there is a will, there is a way. Deliberate investments in sensitization and awareness of science subjects to the girl child, mentoring of girls and young women, elimination of the gender bias and discrimination in our society, and strong governmental support for women in research and adequate funding are factors that will enhance the critical mass of the female gender equipped with knowledge and skills in science and position them to contribute significantly to sustainable development.

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Introduction

Demographically, the population ratio of male to female is about 1:1 (Figure 1) hence, if the world were a true democracy, women ought to be at par with men with regards to opportunities and advancement; but this is not so (Ritchie & Roser, 2019). Women face cultural prejudices and other discriminatory factors on many fronts thus they are heavily under-represented in many facets of life; it is no wonder the world has not progressed further. The voice of half the population, half of the solution to the world's problems is being silenced.

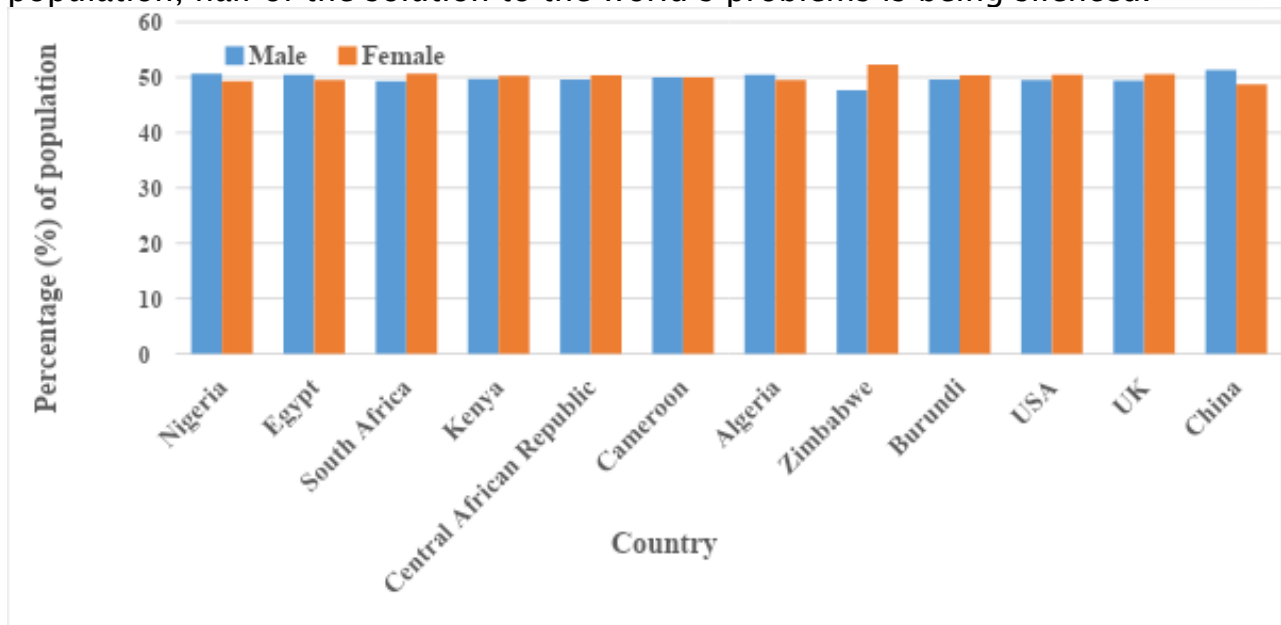


Figure 1: Gender Proportion in Some African countries compared with other non-African countries. Adapted from data obtained from the World Bank, (Population, female (% of total population), 2020.

Women are often excluded from decision making processes, denied access to capital and even education in some communities. It is no secret that economic loss due to gender gap is enormous and can be up to 30% in some countries (Dabla-Norris & Kochhar, 2019). Figure 2 indicates student enrolment into

tertiary education is heavily skewed in favour of the male gender. A UNESCO report reveals that women enrollment in Science, Technology, Engineering and Mathematics (STEM) courses is low, ranging from ICT (3%); natural sciences, mathematics and statistics (5%); as well as engineering, manufacturing and construction (8%) (1.2 Participation and progression in STEM education, 2017).

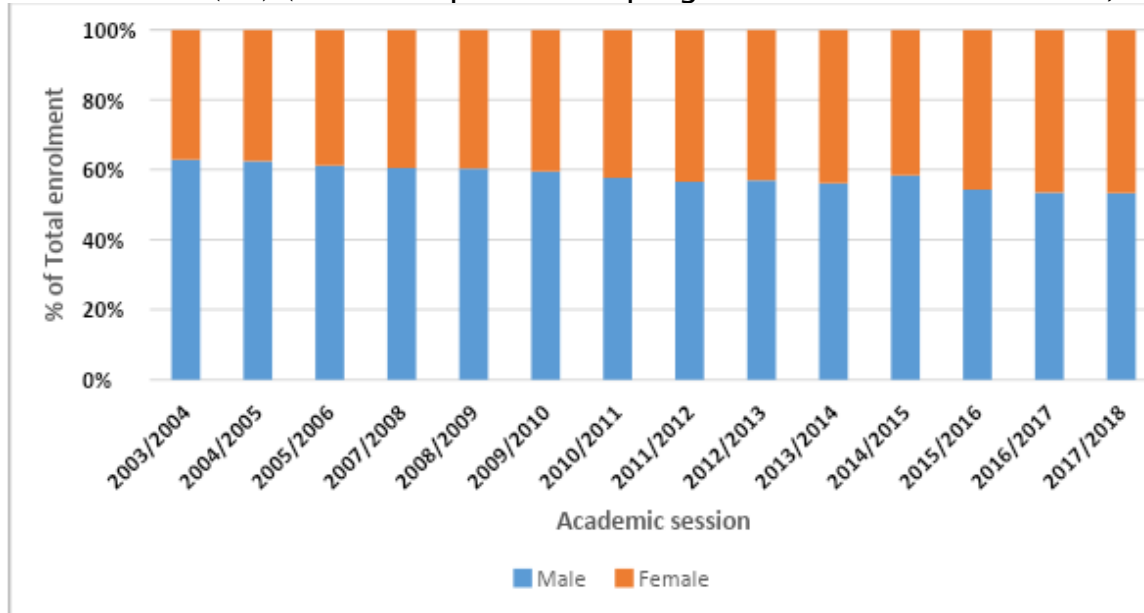


Figure 2: Gender Spread of Students' Enrolment at the University of Ibadan, 2003–2018

(Source: Planning Unit, Office of the Vice Chancellor, University of Ibadan, Ibadan)

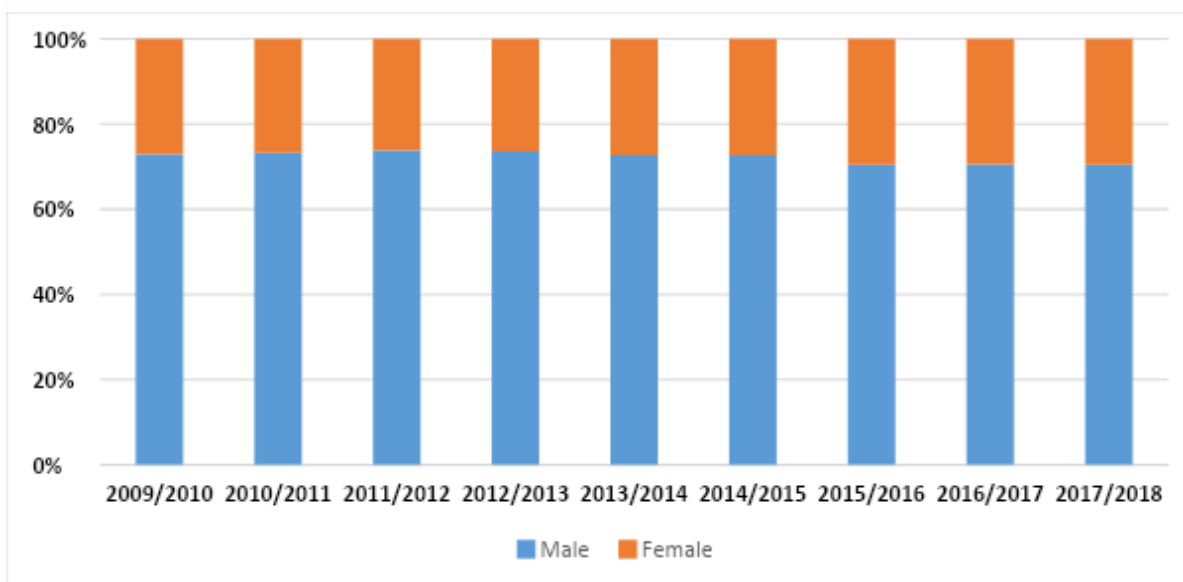


Figure 3: Gender Spread of Academic Staff at the University of Ibadan, 2009–2018

(Source: Planning Unit, Office of the Vice Chancellor, University of Ibadan, Ibadan)

This trend is also reflected in employment statistics (Figure 3). Abdelsalam (2017) reported that in Democratic Republic of Congo, Nigeria and Sudan women employed in the public sector are stereotyped and discriminated against by being disregarded for high-level positions by men who consider themselves more capable employees (Abdelsalam, 2017). As such, women are overlooked for promotion and encounter the ‘glass ceiling’, which hampers their efforts at accomplishing their career goals.

The Nobel Prize is the most prestigious prize in the world. To date, more than 950 awards have been made but only 57 (5.9%) have gone to women (Nobel Prize awarded women, 2020). Of these 56 women (because Marie Curie won twice), there are only three African recipients namely – Wangari Maathai from Kenya (the first black African woman to win Nobel Prize), Ellen Johnson Sirleaf from Liberia and Leyman Gbowee from Liberia (Nobel Prize awarded women, 2020). Only 25 (2.7%) women worldwide have won the Nobel Prize in Scientific disciplines to date and none from Africa yet. Further, women still occupy a small minority of top-level positions in the world. Africa has had only nine female Presidents (elected and acting) and currently, there is only one female president, Sahle-Work Zewde, in Africa out of 54 presidents (Ohemeng, 2019). She is the first elected female president of Ethiopia (October 2018 – date). Perhaps, someday, it will be Nigeria’s turn.

Regarding academia, Nigeria has only produced 20 female Vice Chancellors (substantive and acting) till date and currently about 11 serving Female Vice Chancellors in 170 Universities in the country; and only about 17% of principal officers in Nigerian Universities are female (Okpi, 2019). It is widely known that many countries of the world have not achieved gender equality in Science, Technology, Engineering and Mathematics (STEM). It was reported by UNESCO that at present, the global percentage of female researchers is 29.3% and only 35% of all students enrolled in STEM related fields in the United Kingdom are women (Women in Science, 2019). Despite statistics that show an

increasing number of female students' enrolment in schools and colleges (Figure 2), many girls still have limited choices for their education and career development.

What accounts for this skew? Is it that women are less intelligent than men or are there other extenuating factors which need to be addressed?

This problem of underrepresentation of women and girls is being addressed by the United Nations through one of the 17 Sustainable Development Goals (SDG) (Sustainable Development Goals, 2020). Sustainable Development (SD) is often defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations General Assembly, 1987) (Sustainable Development, 2019). The fifth SDG is to achieve gender equality and empower all women and girls. There are 9 targets linked with this goal. The first target is to end all forms of discrimination against all women and girls everywhere (Goal 5: Achieve gender equality and empower all women and girls, 2020). Achieving gender equality is very crucial to achieving all the other 16 SDG goals. Women are drivers for sustainable development because women hold such a strategic position in the society and are naturally endowed to multitask. It has been demonstrated that empowerment of girls and women educationally has a "multiplier effect" and it can hasten economic growth and development (Educated girls, a uniquely positive force for development, 2004). Further February 11 of every year has been declared as the "International day of Women and girls in science" by the United Nations.

**Obstacles Women and Girls Face in Their Quest to Advance
Discrimination**

The first obstacle that women and girls face is gender bias and discrimination regarding access to education, opportunities, and funds. In some cultures, girls are deliberately denied education because it is believed that the girl's traditional role is in the kitchen or farm. Boys are sent to school while the girls are kept at home (13 reasons why girls are not in school on International Day of the Girl Child, 2017). Girls are not allowed to or encouraged to apply or study some science courses which are believed to be in the remit of the male gender and

hence they are excluded from opportunities to contribute their own quota to national and global development.

In some establishments, there is a ceiling beyond which the female employees cannot ascend; hence their progress is impeded. Some female researchers have reported discrimination in access to some research funds and barriers to publications in some journals (Weale & Barr, 2018). All these have hindered the progress of women in their careers.

Family Commitments

Prozesky and Mouton (2019) reported that balancing career and family commitments is a major challenge that female African scientists face as they aspire to career advancement (Prozesky & Mouton, 2019). Many women have put their careers on hold to go and raise their families and for some women this subsequently retards their career progression. In extreme situations some women have had to quit or change to jobs beneath their competency as a trade-off for having more time to spend with family. Successfully balancing family commitments and career advancement can sometimes seem like a mammoth task for women. What a dilemma!

Lack of Institutional and Infrastructural Support

Some girls have been discouraged from pursuing careers in science due to the largely theoretical approach to teaching science in some schools. There are inadequate opportunities to experience these scientific concepts in practical terms and thus feel empowered to contribute to the body of scientific knowledge and discovery. Also, the dearth of support from employers and institutions has accentuated these challenges. For example, many women struggle with the lack of or inadequate provision of childcare facilities and paid maternity. Gender inequalities in pay are another failing on the part of employers. Women are entitled to be paid in equal fashion as their male contemporaries for doing the same job. Furthermore, women often work in junior roles compared to men and are usually not in leadership roles where critical decision-making is done (Muthumbi & Sommerfeld, 2015). The private sector tends to offer better financial remuneration but again, women are more likely to be employed in government-owned facilities (where the pay is less)

compared to their male counterparts (Muthumbi & Sommerfeld, 2015). These issues can demoralize women; prevent some from reaching the peak of their careers and they might end up being unfulfilled in their career.

Low Self-esteem

A major obstacle common to most women is our lack of trust in our own ability as a girl or woman. Considering the odds stacked against the female scientists, there might be poor motivation to pursue science as the costs might appear to outweigh the benefits. Sometimes, women falsely believe that they are second fiddle and inferior to men. This might be a function of the constant onslaught of gender stereotypes and cultural bias on women peddled by parents, teachers and even peers which stipulate the careers they are “allowed” to pursue.

Lack of Mentorship

Successful female STEM professionals sometimes overlook the importance of bringing up the next generation of STEM professionals through mentorship. Lack of mentorship and role models have been a key obstacle for career progression of many women (Cross, *et al.*, 2019). Many simply do not have relatable role models to aspire to. Also, they might not have anyone to encourage them or help them navigate the journey of career development as a female STEM professional.

The Way Forward

The reality of the often harsh working conditions of women in science can neither be denied nor wished away. However, being lethargic or resigning to these situations are not valid options because many women have gone on to excel in their different professions and contributed significantly to human development despite the challenges they faced. A few examples of such great women include Marie Curie, Margaret Thatcher, Ellen Johnson Sirleaf, etc. The section below provides a synopsis of the achievements of some of these women.



Prof. Marie Curie (1867 – 1934) was awarded the Noble prize in Physics in 1903 with her husband, Pierre Curie. She was the first woman to win a Nobel Prize, the first person to win two Nobel Prizes and the only woman to win in two scientific fields. She was also the first woman to become a professor at the University of Paris. During World War I, Marie Curie worked together with her daughter Irene to provide mobile X-ray units for the French soldiers.

Her first daughter, Irene, was also jointly awarded the Nobel Prize in Chemistry alongside her husband, Frederic Joliot in 1935.



Dr. Margaret Thatcher (1925 – 2013) was the first woman Prime Minister of Great Britain and Northern Ireland (1979 – 1990) and the longest serving Prime Minister in the 20th century. She first trained as a Chemist before becoming a barrister and politician.



Dr. Ellen Johnson Sirleaf (1938) is the first African woman to be elected as President of a country. She was president of Liberia from 2006 to 2018. She also won the Nobel Peace prize in 2011 in recognition of her efforts to bring women into the peacekeeping process. She studied Accounting and Economics. She worked at the World Bank and later became the first female Liberian Minister of Finance.



Professor Adetowun Ogunseye (1926) is the first female professor in Nigeria, and a foundation student at the University College Ibadan, now University of Ibadan, Nigeria's Premier University. She studied Geography and then Library Science and Education. She is also the first Female Dean of any Faculty in Nigeria.



Professor Grace Alele-Williams (1932) is the first Nigerian Female Vice Chancellor and a Professor of Mathematics Education. She made history as the first Nigerian woman to be awarded a doctorate degree. Despite her commitment to science, mathematics, education, women and public service, her family life has not been neglected. She has five children and many grandchildren.



Professor Bolanle Awe (1933) is the first Nigerian woman to be formally appointed as a lecturer in a Nigerian tertiary institution. She is a Professor of Oral History and the foundation director of Women's Research and Documentation Centre (WORDOC) which is the first of its kind in Nigeria. The centre was established to serve as a resource centre/library for the study of women in Nigeria and the world.



Flying Officer Tolulope Arotile (1995 – 2020) is Nigeria's First Female Combat helicopter pilot. She was awarded a Bachelor of Science in Mathematics at the Nigerian Defence Academy. She contributed significantly to combat operations against insecurity in Northern Nigeria. She was described as fearless, effective, and deadly in her fight against terrorism in Nigeria. She was killed in an accident at the Nigerian Airforce base in Kaduna, Nigeria at the age of 24 years. May her soul rest

in peace.

How did the women trail blazers make it? What is the secret of their success?

Personal Faith and Determination

The first hurdles a woman must cross in order to succeed are a strong belief in one's God-given ability and a determination to succeed despite all odds. "If an idea is conceivable, then it is doable". The girl /woman must believe that God created her for a purpose and God has given her strong abilities to fulfill that purpose and that with God all things are possible.

Sound Education

The fourth goal of the SDGs is easy access to basic and secondary education for all irrespective of their locality and status (Goal 4 Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, 2020). The government at all levels should provide the enabling environment for girls to be able to access good quality education. There should be appropriate guidance counseling in the schools and regular awareness campaigns on scientific study and motivational talks for girls in primary and secondary schools by successful career women. This does not only stimulates an interest in science, but also helps to identify good role models for the girls.

Role of Government

The government also has a role to play in providing a conducive environment for the female gender, for example adequate paid maternity and paternity leave. Incentives, such as financial inducements could be offered to parents who allow their girls to complete their education. This was done in Pakistan and

India at a time (Demand–Side barriers to Girl's secondary education in Madhya Pradesh, India, 2013). Scholarships and bursaries can also be provided for girls' education. Institutional reforms are needed to make the workplace more gender friendly, for example providing on–site childcare facilities at work. There should also be deliberate planning and budgeting for gender equality, so that women are paid fair wages.

Support Network and Mentoring

It is important to have a good support network. Families should be a primary source of such support, for example husbands supporting their wives, parents supporting children and siblings helping each other to achieve their goals. Parents must teach their children, especially the girls to strive for excellence in all they do. They should know that success is possible and achievable. They must be ambitious and always desire to be the best by working hard.

Strong mentorship programs for women and girls should be set up in secondary schools and tertiary institutions. This could be done by associations like Nigerian Association of University Women (NAUW). STEM scholarships could be awarded annually to girls in secondary schools to further motivate them. Prizes can also be instituted by individuals and organizations for the best female graduating students in STEM and related fields.

Women should form networks to support each other. A scheme was established at the Obafemi Awolowo University some years ago which enabled many early career female academics to settle into their job and make rapid progress in their career.

Institutional and NGO Support

Some private and international agencies have also been supportive of women's careers. Organisations like Schlumberger Foundation, Elsevier Foundation and L'Oréal UNESCO have provided dedicated fellowships and programs to support women's research activities, especially in the sciences. The United Nations has also declared February 11 as the "International day of Women and Girls in Science" by resolution of the United Nations General Assembly on 22 December 2015 (International Day of Women and Girls in Science, 2020). The day is to recognize the critical role women and girls play in science and technology. This

is very encouraging and more of these efforts and programs are required to help women advance in their career and contribute to sustainable development. It is important to elect and appoint more women to top-level positions in government and institutions to enhance and promote gender equality especially in decision making processes. All these suggestions would ensure that women and girls are encouraged to take their place in the society for positive impact and sustainable development.

My Contributions

Being a woman in STEM myself, I have not just been a passive observer. I have been involved in training girls' right from the home front. I am married to an academic who for considerable periods had to work away from home, thus the duty of raising the children fell to me periodically. We have two daughters with whom I spent quality time when they were young to help them in their studies and motivate them to strive for excellence. Sometimes I took them to my laboratory/office after school to continue with their private lesson and study, while I also tried to do my work. I visited their school regularly to monitor their progress. I interacted with their teachers and the leadership of their schools. I took an active part in school activities and Parents-Teachers Association meetings to keep abreast of developments in their schools. I supported them in their career choices and encouraged them to read books outside their regular academic books. This has yielded good dividends as both daughters have grown to become successful professionals and are contributing to sustainable development in their areas of influence. The success achieved came at a price for me career-wise. It meant my career progression was not as fast as it should be because I devoted quality time to taking care of the home. However, the sacrifice has paid off by the grace of God. Hard work, strong determination, perseverance, and faith in God have helped me to reach the peak of my career as an academic and contribute to the development of my nation. I must also acknowledge the strong support and encouragement of my parents and husband in the process.

I also mentor young ladies in the University, community and my church. My husband and I run an open house where I invite girls over from time to time to interact with them and counsel them on their studies and relationships. I

assist these young ladies with free accommodation in my house and I reach out to their families too as the need arises. I have supervised several students at various levels and sought out ways they could have more exposure in laboratories in international centres of excellence to accelerate progress in their studies and career. I have successfully graduated nine PhDs, three of which are females and all of them were exposed to state-of-the-art research facilities in developed countries around the world.

I am the current Focal Person and Coordinator of the Gender Mainstreaming Office (GMO) in the University of Ibadan. The GMO takes part in the orientation program for the new students in the halls of residence and in their departments to sensitize the students on the gender and sexual harassment policies of the University. The office also organizes sensitisation and training workshops for the students and staff on these policies and other issues pertaining to campus life. We also operate an open-door policy so that students and staff can walk into the office for counseling and help as needed. We have Gender Focal Persons among the staff that interacts with students at various levels. The Office is also working with the Department of History and the Advancement Centre in the University to compile a compendium of Female alumnae who has gone on to impact their world.

Conclusion

In conclusion, girls and women are challenged to rise up and take their place in the sustainable development of our world.

Join the league of achievers.

Do not let that dream die!

Start from your little corner.

Remember if it is conceivable, it is achievable. The convener of this conference, Dr. Peju Oti is a good example of achievers and a role model. We need female, African Nobel prize winners in the sciences. Nigeria needs you; Africa needs you; the world needs you. The world is waiting for you. Women are drivers for sustainable development.

ARISE...

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Asset-based Approach for Measuring Socio-Environmental Vulnerability of An Indigenous City of Ile-Ife, Nigeria

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Abstract

Using an asset-based approach to generate the Socio-environmental Vulnerability Index (SEVI) for inner part of Ile-Ife, an indigenous city in the South West Nigeria, this study examines some socio-economic and