THE NIGERIAN ACADEMY OF SCIENCE

Women in Science and Nigeria's Development

Summit Report

THE NIGERIAN ACADEMY OF SCIENCE

Women in Science and Nigeria's Development

SUMMIT REPORT

ISBN: 978-978-989-869-5

The Nigerian Academy of Science
Academy House
8a Ransome Kuti Road, University of Lagos
PMB 1004, University of Lagos Post Office, Akoka, Yaba
Lagos, Nigeria
Tel: +234 808 962 2442
Email: admin@nas.org.ng
Website: www.nas.org.ng

Suggested Citation: Odubanjo Oladoyin, Olanipekun Anjola, Onyema Blessing (Editors). Women in Science and Nigeria's Development. Summit report. The Nigerian Academy of Science, 2021. Lagos, Nigeria.

Acknowledgments

The Nigerian Academy of Science (NAS) acknowledges the immense contributions and efforts of numerous individuals and organizations whose support made the summit possible, contributed to the discussions, and enriched the quality of this report.

We also wish to thank the following for their review of the report:

- Dr. Temitope Sogbanmu: Lecturer, Department of Zoology (Environmental Toxicology Unit), University of Lagos, Nigeria
- Professor Adeyinka Falusi FAS: Professor of Haematology and Founder/President, Sickle Cell Hope Alive Foundation, Ibadan, Nigeria
- Ms. Arlen Hastings: Former Director of External Projects, Institute for Advanced Study, Princeton, New Jersey, USA

Although the reviewers provided many useful comments, they were not asked to endorse the final draft of the report.

Disclaimer

The views and opinions expressed in this article are those of the summit speakers and participants, and do not necessarily reflect the position of the Nigerian Academy of Science (NAS).

Table of Contents

About the Nigerian Academy of Science

The Nigerian Academy of Science (NAS) is the foremost independent scientific body in Nigeria which was established in 1977 and incorporated in 1986. NAS is uniquely positioned to bring scientific knowledge to bear on the policies/strategic direction of the country and is also dedicated to the development and advancement of science, technology, and innovation (STI) in Nigeria. The aims and objectives of the Academy are to promote the growth, acquisition, and dissemination of scientific knowledge, and to facilitate its use in solving problems of national interest. The Academy strives to do this by:

- Providing advice on specific problems of scientific or technological nature, presented to it by the government and its agencies, as well as private organizations

- Bringing to the attention of the government and its agencies, problems of national interest that science and technology can help solve

- Establishing and maintaining the highest standards of scientific endeavours and achievements in Nigeria, through the publication of journals, organization of conferences, seminars, workshops, and symposia, recognition of outstanding contributions to science in Nigeria, and the development of a working relationship with other national and international scientific bodies and academies

As with national academies in other countries, NAS is a not-for-profit organization with a total membership (since inception) comprising 258 Fellows (who have distinguished themselves in their fields both locally and internationally), elected through a highly competitive process. Some of her members have served as vice-chancellors of universities, directors-general of government parastatals, and ministers in federal ministries. The Academy, given its clout, also has the ability to attract other experts from around the country and internationally when needed. NAS is Nigeria's national representative on such bodies as the International Science Council (ISC – the umbrella body for all science associations and unions) and the Inter-Academy Partnership (IAP – the umbrella body for all national science academies globally). The Academy is a member of the Executive Committees of IAP for Science, IAP for Policy, and IAP for Health and a member of the Network of African Science Academies (NASAC).

The Women in Science Summit

Gender inequality is a problem that has plagued humanity throughout history. Although strides have been made in improving the plight of women across the globe, there is still much to be done. It is therefore not surprising that ''ensuring equal rights and opportunities for girls and women everywhere'' is one of the developmental goals that the United Nations has set for 2030.

Under-representation and exclusion of women cuts across geographical locations; it is a problem in developed, developing, and under-developed parts of the world. It also cuts across sectors; it occurs in business, entertainment, politics, and science/research. The United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics (UIS) gives the percentage of women researchers globally as 28.8%, and for sub-Saharan Africa, 31.3%. For Nigeria, it is only 23.3%, lower than both the global and sub-regional averages.[1] Furthermore, there appears to be a ''leaky pipeline'' in the career progression of women scientists, with significant dropout after the undergraduate levels. Incidentally, this drop-off in number leads to a lack of visibility of female researchers, meaning that there are fewer role models for the next generation of female scientists.

In Nigeria, scientists face a myriad of challenges in the pursuit of research endeavours, including lack of funding and infrastructure, as well as apathy for science on the part of the larger society. In addition to these, female scientists have to deal with gender-specific challenges, including bias, cultural and religious barriers, managing the family-career balance, as well as lack of opportunities for collaboration. Nigeria needs science and technology to thrive, so there needs to be significant efforts to propel science as a whole, and empower women scientists in particular.

As a first step towards empowering Nigerian women scientists, the Nigerian Academy of Science (NAS) organized the ''Women in Science Summit'', to propose strategies for empowering women and girls in science, equip them to thrive, and make a major impact on Nigeria's development.

The objectives of this Summit were:

1. To create a platform to discuss the role of women in science and sustainable development, with a focus on Nigeria

[1] UIS Fact Sheet No. 51 June 2018. Available at http://uis.unesco.org/sites/default/files/documents/fs51-women-in-science-2018-en.pdf

2. To raise the awareness of relevant stakeholders to the challenges faced by women scientists in Nigeria
3. To foster mentorship and collaboration among Nigerian women in science
4. To identify implementable development strategies for women in science in Nigeria

List of Figures

Acronyms and Abbreviations

ERGP	*Economic Recovery and Growth Plan*
GO-SPIN	*Global Observatory of Science, Technology and Innovation Policy Instruments*
NAS	*The Nigerian Academy of Science*
NASAC	*Network of African Science Academies*
OWSD	*Organization for Women in Science for the Developing World*
SAGA	*STEM and Gender Advancement*
SDG	*Sustainable Development Goal*
STEM	*Science, Technology, Engineering and Mathematics*
STI	*Science, Technology and Innovation*
STISA	*Science Technology and Innovation Strategic Agenda*
UNDP	*United Nations Development Programme*
UNESCO	*United Nations Educational, Scientific and Cultural Organization*
WIS	*Women in Science*

Executive Summary

The *Women in Science Summit* took place on the 21st and 22nd of October, 2019 at Reiz Continental Hotel, Abuja. The summit was convened by the Nigerian Academy of Science, with support from the United Nations Educational, Scientific, and Cultural Organization (UNESCO), as well as the University of Medical Sciences Ondo, University of Lagos, and Chrisland University, Abeokuta. In attendance was a broad range of participants, ranging from researchers, academics, NAS Fellows, to representatives from government agencies, civil society, the private sector, and the media.

The objectives of the summit were to create a platform to discuss the role of women scientists in Nigeria's development, raise the awareness of relevant stakeholders to the challenges faced by Nigerian women scientists in Nigeria, and to foster mentorship and collaboration among Nigerian women in science.

The summit's welcome address was delivered by the NAS President, Professor K. Mosto Onuoha, FAS on the importance of science, technology, and innovation (STI) as a tool for national development. In his goodwill message, the Minister for Science and Technology, Dr. Ogbonnaya Onu, [represented by Dr. Eucharia Oparah, the Director-General, Nigerian Institute for Leather and Science Technology (NILEST)], said women scientists constitute an indispensable force in nation building, and could leverage on their academic advancement and resilience to advance the economy using the dividends of science, technology, engineering and mathematics (STEM). Mr. Ydo Yao – Director, UNESCO Regional Office, Abuja - emphasized that gender discrimination constitutes an infringement on basic human rights, and that the objectives of the summit aligns with UNESCO's priority of promoting gender equality in STI.

The keynote address, delivered by Mrs. Jackie Kado, the Executive Director of the Network of African Science Academies (NASAC), emphasized the concepts of 'Science for Science', 'Science for Policy', and 'Science for Society'. According to her, these concepts would ensure that science produces demand-driven research, and that research outputs are integrated into policy making processes.

This set the stage from which plenary sessions and discussions followed. To capture relevant issues, challenges and factors affecting Nigerian women in science, there were sessions on *Nigerian women in science: A historical perspective; Women scientists for the Sustainable Development Goals (SDGs); Women as drivers of economic development; Women in science: policies, programmes, and practices; Women in science: challenges and*

opportunities; Women leaders in science; and *Mentorship and collaboration among Nigerian women scientists.*

The first session offered an overview of outstanding women scientists, their contributions to the advancement of science and technology in Nigeria, and ultimately to national development. During the course of the presentations, several female scientists who have made notable achievements in STEM fields were recognized. It was stressed that men need to play a distinctive role in the development of women scientists, and support women, because collaboration is key to scientific growth.

Presentations at the next session offered insights into Nigeria's strategic implementation plans for the SDGs. According to one of the speakers – a representative from the Office of the Senior Special Assistant to the President on SDGs - the Federal Government of Nigeria has integrated the three dimensions of the SDGs (economic, social, and environmental) into the country's Economic Recovery and Growth Plan (ERGP) 2017-2020. Core areas of the SDGs, such as food security, agriculture, energy, infrastructural development, industry, macroeconomic stability, and inclusive growth, have been given special attention in the ERGP. The roles and potential contributions of women scientists towards attainment of the goals were discussed.

At a panel session, the link between education, the empowerment of women, and economic development was discussed. As women constitute about half of the total population, investment in quality education for women (SDG 4) would also bring about a positive effect in other areas (such as gender equality, reduced poverty, decent work and economic growth).

Gaps in existing social and political frameworks to support women were reviewed, and strategies were proffered for addressing the gaps, specifically, in attracting and retaining girls and women in STEM fields. Aspects of UNESCO's STEM and Gender Advancement (SAGA) Project, as it applies to Nigeria and Africa were shared, and the need to develop gender-inclusive STI policies in Nigeria was emphasized.

The next session focused on the challenges faced by women in STEM fields, and especially in science leadership. Although women have striven to distinguish themselves academically, men still occupy most top leadership positions in research/academia. There is therefore a need to support women to take up such leadership positions by addressing the gender gap at the primary levels of education, mentor young girls and women through tertiary education, and provide opportunities for collaborations to enable them progress up the academic ladder.

After these sessions was a general discussion on *Way forward: empowering Nigerian women scientists.* Lessons from the summit were highlighted, and recommendations proposed as follows to strengthen Nigerian women's involvement in STI, and increase their input to national development frameworks:

1) Individual women scientists
    a. Develop self-confidence to be able to take on higher responsibilities.
    b. Learn from successful women scientists, who are successfully balancing work and career (seek for mentorship).
    c. Be diligent and work hard.
    d. Be focused.
    e. Mentor other young women/girls.
    f. Join relevant networks

2) Institutions (government, private sector, academia):
    a. Institutionalize formal mentoring for female scientists.
    b. If not in existence, gender and sexual harassment policies should be developed, and enforced.

3) The NAS

    The NAS should advocate for:

    a. Policies which encourage girls to take STEM subjects in primary and secondary schools, including:
        - Capacity building for STEM teachers in appropriate pedagogy for effective delivery (making STEM learner-friendly)
        - Strengthening laboratory facilities and exploring the use of science kits to make STEM learning interesting
        - Introducing STEM-based clubs, career talks, and counselling in schools
        - Providing tertiary education scholarships for outstanding girls in STEM

    b. Policies which support the recruitment and retention of female scientists, including:
        - Research grants targeting female researchers
        - Age-flexible PhD training/support
        - Science/research grants for females who have taken career breaks due to child care/parenting

    c. Celebrate and provide visibility for women and girls excelling in STEM:

- Celebrate the International Day for Women in Science in an inclusive way
- Institute awards and prizes for outstanding girls in secondary and tertiary institutions, as well as early career women scientists, such as the AU Regional Prize for Women

All of these strategies are to be institutionalized at all government levels, in academia, and in the private sector.

At the end of the event, Professor K. Mosto Onuoha made the closing remarks in which he enjoined participants to take the key messages of the workshop back to their institutions and encourage implementation of the recommendations at the individual and institutional levels.

Opening Session

Welcome Remarks

Professor K. Mosto Onuoha FAS *– President, NAS*

It is a great privilege to be present at the *Women in Science Summit* organized by the Academy. I welcome you all to this event. Various challenges are faced by Nigerian women in science fields, and despite the challenges, Nigerian women scientists have achieved great heights in their various areas of specialization.

Great feats are achieved not by large numbers, but by the commitment of a few people. Present in this summit are various such women in science, science education, and industry, who have distinguished themselves nationally and internationally, and won various awards. It would be useful to hear from them directly what challenges they have faced in the course of achieving their goals. These lessons would be useful to young, upcoming scientists, and would be a source of inspiration to them. Hopefully, the mix of the older and younger generations here in this gathering would help realize one of the goals of this summit to foster mentorship and collaboration among scientists.

Various events and conferences have been organized over the years, with the aim of empowering women. This summit aims to go beyond other such events by promoting dialogue among scientists, and, providing evidence-informed advice to policy makers on the value of women's participation and inclusion in national frameworks for realization of the Sustainable Development Goals (SDGs). It is expected that the discussions and outputs from the summit would be of great value towards generating action points that would ultimately put women in the forefront of attaining sustainable development in Nigeria.

Goodwill Messages

> ***Ogbonnaya Onu*** – Honourable Minister, Federal Ministry of Science and Technology. *(*Represented by Eucharia Oparah - *Director-General, Nigerian Institute for Leather and Science Technology)*

The theme for this meeting, "Women in Science and Nigeria's Development", is apt and timely considering the prevailing economic, cultural, and political discrimination against women, not only in Nigeria, but in the world at large.

Over the years, women have shown that they are not deficient in intellectual capacity, as they can compete favourably with their male counterparts. Many women have made breakthrough discoveries in Chemistry, Physics, Medicine, and other science disciplines, and 20 women have won Nobel Prizes in the sciences. Nigerian women have not been left

behind. We have the likes of Captain Chinyere Kalu, Engr. Grace Ezema, Dr. Elizabeth Abimbola Awoliyi, Professor Olabisi Ugbebor, and many others. These women broke forth against all odds to make history and set the pace for other women. The saying, "What a man can do, a woman can do better" is no longer a tale as displayed by these women. Nigerian women are breaking the barriers of culture and tradition to embrace science and technology. The Federal Ministry of Science and Technology is embarking on various projects aimed at grooming young girls to become professional scientists and engineers.

Women have a role to play in nation-building. Women are therefore encouraged to remain resilient in their pursuit in Science, Technology, Engineering and Mathematics (STEM) disciplines, and in politics. The provision of **Executive Order No. 5 for Planning and Execution of Projects, Promotion of Nigerian Content in Contracts, Science, Engineering and Technology** should be harnessed by Nigerian women. The main goal of this Executive Order is to harness domestic talents and develop indigenous capacity in science and engineering, for the promotion of technological innovation needed to drive national competitiveness and productivity, which would invariably enhance the achievement of national development goals across all sectors of the economy.

Finally, women in science constitute an indispensable force in nation building as they can leverage on their academic advancement and inherent resilience to bring the dividends of STEM into our nation's economic development.

Yao Ydo – *Director, UNESCO Multisectoral Regional Office, Abuja*

I am delighted to be here today and deliver a goodwill message at this important *Women in Science* Summit, with the theme, *"Women in Science and Nigeria's Development*". This event aligns with UNESCO's priority of promoting gender equality in STI.

Ladies and gentlemen, UNESCO has the mission to build peace through international cooperation in education, the sciences, culture and communication, and information. UNESCO has two global priorities; Africa and gender. In its Gender Priority Plan, UNESCO believes that all forms of discrimination based on gender are violations of human rights, as well as a significant barrier to the achievement of the 2030 Agenda for sustainable development and its 17 Sustainable Development Goals. As such our message is clear: "women and men must enjoy equal opportunities, choices, capabilities, power, and knowledge as equal citizens". Therefore, equipping girls and boys, women and men with the knowledge, values, attitudes, and skills to tackle gender disparities is a precondition to building a sustainable future for all.

As you may know, Science, Technology and Innovation (STI) are recognized as key factors for development at national, regional, and global levels. STI also plays a very vital role in achieving the 17 Sustainable Development Goals by 2030. On the other hand, the formulation, monitoring, and implementation of relevant STI policies is crucial to addressing major development challenges such as poverty eradication, food security, climate change, access to energy, eradication of endemic diseases, as well as management and preservation of the environment. Therefore, developing, formulating, and implementing relevant STI policies that are inclusive and have favourable conditions for achieving gender equality, has become an absolute necessity today. Suffice it to say that these policies must be based on accurate and up-to-date data, and underpinned by coordinated inventory and good mapping of STI operational bodies, structures, and instruments, including the STI regulatory framework.

UNESCO has been supporting its Member States in the development of national STI policies and plans. In West Africa, in recent years, UNESCO has notably supported the reform of the STI system in Nigeria, the development of Senegal's STI policy, and we have been asked for support in 2019-2020 in Sierra Leone, Ghana, Liberia, and Guinea.

One of the flagship programmes of UNESCO's action in STI policies is the Global Observatory of Science, Technology and Innovation Policy Instruments (GO-SPIN), which offers a methodological approach and tools to collect, analyze, and provide key information on STI policies, operational instruments, STI legal frameworks, STI priorities, as well as indicators. Beyond providing a methodology for collecting and analyzing this data, GO-SPIN is a tool for capacity building, assisting with STI governance, and identifying gaps in political instruments and legal frameworks. UNESCO Regional Office Abuja, in collaboration with the Federal Ministry of Science and Technology, has already developed STI project document for Nigeria which will utilize and build capacity in GO-SPIN. We are hoping that Nigeria, in collaboration with relevant partners will implement this project, which will provide the needed data for developing workable, gender inclusive STI policies.

Another flagship programme of UNESCO's action in STI policies, which has a direct bearing with this summit, is *STEM and Gender Advancement (SAGA)* Project. The SAGA project has contributed to identifying and addressing gender gaps in STEM fields at all levels of education and research. It also has contributed to the promotion of girls and women in STEM by supporting key stakeholders in the design and implementation of STI policies for gender equality. My colleague will be telling you more about this project and its usefulness in bridging the gender gap in STI. Just in November 2018, we were able to train 25 participants from 8 countries in West Africa; on using the SAGA tools. Four of these participants were from Nigeria. The trainees received first-hand training from UNESCO Institute for Statistics - the UNESCO Category one institute implementing the SAGA project.

In 2020-2021 we are planning to work with our member states in the region to undertake capacity building and data gathering for development of STI policies for gender equality.

Before I close my speech, I will like to thank the Nigerian Academy of Science for finding UNESCO a worthy partner in organizing this summit. I also thank each one of you for coming here today, and encourage you to make the best of this summit. UNESCO will be very willing to give technical support to take forward the recommendations of this summit; working in partnership with all relevant national actors.

Many thanks for your kind attention.

Keynote Address: Shaping Africa's Future through STI: The Place of Women Scientists

***Jackie Kado**- Executive Director, NASAC*

It is truly a great honour to be here today. A day when we experience, firsthand, the true meaning of transformational science, the type that is useful and guarantees better lives, in Africa, in general, and in Nigeria, in particular. At this summit on *Women in Science*, we will hear about women who, through science, continue to support the realization of the SDGs on our local agendas, with specific reference to cross cutting SDG 5. When we talk about gender equality and empowering all women and girls, ensuring that they live healthy lives that promote their wellbeing at all ages, then what better place to start other than this summit? Let us simply take a moment to apply a gender lens on the scientific activities undertaken in our continent.

I bring you greetings from my President, Professor Mostapha Bousmina of Hassan II Academy of Science and Technology, Morocco, the NASAC Board, and acknowledge our host, one of the NASAC members, the Nigerian Academy of Science.

Having said that, allow me to start from the basics: ***What really is the place of women scientists in our academies and what roles do they play?*** Well, I put it to you that they rarely lead… even when they are recognized as eminent scientists globally and honoured nationally for their contribution in various scientific fields including engineering, technology, and innovation. Not just the ***hard sciences*** – applied and engineering sciences but also ***soft sciences*** – humanities and social sciences. Yes, they exist, but we hardly see them. I wonder why?

It follows then, that it is incumbent upon a network like NASAC, which is the umbrella organization of these national academies, to say and do something about it. And we have tried, since we exist not just because both male and female scientists are important people, but simply because the structures, systems, and institutions that support African women scientists have to be safeguarded. Basically for three critical reasons:

1. Undertake SCIENCE FOR SCIENCE

NASAC exists to ensure that African scientists (both men and women) contribute to the body of scientific knowledge. This means ensuring that scientific excellence is maintained at a world class status in spite of the myriad of challenges we face – be it on gender or development. Africa's future will be secure if, in championing science for science, African women scientists are facilitated to become producers of cutting-edge scientific research that result in world class knowledge. It is important for women to become the "*voice of science*" in the global arena, and guarantee a place at the table for relevant African issues

that speak to and uphold our traditional or indigenous knowledge and culture without forgetting the intellectual property of this knowledge or the copyright regimes that can be explored. In support of science for science-sake, we should therefore seek partnerships that focus on integrated or transdisciplinary research for purposes of ensuring that the next generation of women scientists sees science as both a noble calling and an enterprising career.

2. Explore SCIENCE FOR SOCIETY

NASAC encourages both male and female scientists to undertake science that is not just good for scientific journals, but is equally relevant for societal application and utilization. Relevant science means science that is useful in and to society for the alleviation of social-economic challenges, transcending cultural barriers and stereotypes, but above all, translational science that guarantees societal well-being and prosperity. To this end, the work of women scientists must support the realization of the African Union Agenda 2063, for the Africa we want. This means science that speaks against prevailing societal ills and, instead, promotes ethics and integrity among the citizenry in society. If women are indeed the pillars of African society, then who is better placed to instil science for society better than the African women scientists. They must be engaged in science that speaks the language of our communities, providing developmental solutions and options that are both timely and relevant. In the process, African women scientists must serve as societal role-models for a better, more inclusive and peaceful society, upholding the collective continental aspirations of human rights, democracy, gender equality and equity, security, and prosperity. Indeed, better governance…

3. Uphold SCIENCE FOR POLICY

Well, with an informed citizenry, then women scientists must explore science that is relevant to the policymaking framework of the continent. This is the only way to influence the developmental agenda of the continent, and to specifically anchor their efforts on the African Union's Science Technology and Innovation Strategic Agenda (STISA) 2024. Through such mechanisms, NASAC facilitates platforms that enable our scientists (both men and women) to dialogue with African policy- and decision-makers so that they can utilize science for purposes of generating evidence-informed policies. This means that African women scientists must engage decision and policymakers at both national and regional levels to help them formulate sound policies that govern science, and also promote sound developmental agendas that incorporate science advice. Finally, a better world for you and me…

I leave this podium with a request that African women scientists must deliver the Africa we want. In Nigeria, this request rests squarely on the shoulder of Nigeria women scientists. Just to name a few:

1) *Professor Grace Alele-Williams,* the first Nigerian female to earn a Ph.D. in Mathematics, the first female Professor of Mathematics, and the first female Vice Chancellor of a university in Nigeria.

2) *Professor Franscisca Okeke FAS* is by all standards a distinguished scientist who has made tremendous contributions to her field – Physics. She won the highly respected L'Oreal-UNESCO Women in Science Award worth USD 100,000 in 2013, in recognition of her notable contributions to the understanding of daily variations of the ion currents in the upper atmosphere. Professor Okeke was the first female Head of the Department, and a former Dean of the Faculty of Physical Sciences in her university.

3) *Professor Deborah Ajakaiye FAS* is Africa's first woman to be appointed a Professor of Physics in 1980. She completed her Ph.D. in Geophysics at the Ahmadu Bello University (A.B.U.), and her Master and Bachelor's degrees at the University of Birmingham and University of Ibadan, respectively. She lectured at Ahmadu Bello University, and later the University of Jos where she rose to the position of Dean in the Faculty of Natural Sciences. Her contributions to the field of Geophysics through her works on 'Geovisualization' have been significant in locating Nigeria's abundant mineral resources.

4) *Professor Olabisi Ugbebor* is dubbed the "Queen of Mathematics" for her outstanding record in Mathematics. She studied at Queen's College, Lagos on G.B. Ollivant Scholarship for her West African School Certificate Course (WASC), and because of her brilliant academic performance the scholarship was specially extended for her to cover the Cambridge Higher School Certificate Course also at Queen's College, Lagos. Following her brilliant performance at the Higher School Certificate Course, the Federal Government of Nigeria awarded her a scholarship to study Mathematics at the University of Ibadan from 1969-1972, where she was the only female in a class of seven Mathematics majors.

5) *Professor Chinedum Babalola FAS* is the first female Professor of Pharmacy at the University of Ibadan. She is also the first female Pharmacist in Nigeria to be inducted as Fellow of NAS (FAS). She obtained all her degrees at the Obafemi Awolowo University (O.A.U.), with specialization in Pharmacokinetics in her doctorate. Professor Babalola is notable for her research that produced a novel high-performance liquid chromatography method for the analysis of quinine in biometrics. This outstanding research led to the elucidation of the pharmacokinetics of quinine in Africans, and

formed the basis of dose optimization in malaria patents. Professor Babalola is one of the scientists that produced the first pharmacogenetic study in healthy and sickle cell patients in Nigerians.

6) *Professor Adeyinka Falusi FAS*, is a Professor of Haematology and former Director of the Institute for Advanced Medical Research and Training, College of Medicine, University of Ibadan. Her focus is in molecular genetics and ethics of research. Her novel findings in the genetic architecture of the haemoglobinopathies specifically of sickle cell disease and the thalassaemias in Nigerians led to her L'Oreal - UNESCO Outstanding Women in Science Award (Africa & the Mediterranean Countries) in 2001. She is currently the Founder and President of Sickle Cell Hope Alive Foundation (SCHAF), promoting translational research at the grassroots level.

Thank you very much.

Session 1: Nigerian Women in Science - A Historical Perspective

The Evolution – The Nigerian Woman, Education, and Science

Olabisi Aina – *Director, Centre for Gender Studies, Obafemi Awolowo University*

A country's ability to secure good health, fight diseases, protect the environment, produce food for its people, and develop new industries and technologies is dependent on the scientific knowledge and skills of its people. Any nation that neglects the provision of good quality science education may quickly find itself the dumping ground of other people's innovations, without the necessary human resources to sustain growth and compete in a global economy. The question is - what roles do women play in the field of science, either in the production and/or use of scientific knowledge?

The girl's reproductive role is much valued over those of acclaimed productive and community roles bequeathed to the boys. Among the Igbo, at birth a baby girl is referred to as "Akpa - ego" (bag of money), or 'unoaku' (house of money), or 'obuteaku' (source of wealth) - valued for the 'bridewealth' received on her. An Igbo traditional song goes: "Be you as beautiful as a mermaid, the beauty of a woman is to have a husband. Be you one who has been to the land of white people, the beauty of a woman is to have a husband. If a woman does not marry, her beauty declines…" Among the Yorubas, she is referred to as "iyawolola" (meaning "future bride'). To the Hausa, the girl child is a bride irrespective of her age.

An historical view on the education of the Nigerian girl child is as follows:

i. Pre-colonial experience

- 'Wifery' /supportive roles
- Women in the domestic sphere; men in the public spheres

ii. Colonial experience

- The Victorian Ideology: the purpose of girls' education was solely to make girls teachers, seamstresses, and cooks who would care for their husband and children's needs. For the average Nigerian father, irrespective of culture, girls' education and training during the colonial era was regarded as a bad investment
- Colonial policies and statutes were clearly sexist and biased against women and girls. This era further devalued the roles of women and girls in general administration and politics, as only men were used as community

administrators. Thus, the cultural and family dynamics surrounding the rights of the girl child during the colonial era were tailored towards a gradual acceptance of Eurocentric principles of education

iii. Post-colonial era

- Issues of the girl child were never a subject of focus and attention during the military era, thus reflecting gender-blind education policies and programmes in the country, with women and girls on the losing side
- The democratization process in Nigeria which resurged in 1999 made a striking impact in its attempt to close the gender gaps in access to basic primary education. Although there is a gradual closing of the gender gaps in school enrolment in the primary level education since the 1990s, gender gaps at the secondary school level remains unacceptably high. The situation is worse off at the tertiary education level, where a ratio of 1:19 had been recorded in favour of males in the faculties of technology in Nigerian universities (Aina, 2002[2]).

Today, society is fast realizing that the girl child is entitled to human rights standards, and needs to be given the same chance as her male counterpart. Gradually, there is awareness that the Nigerian girl-child needs education in order to be independent in later years. It is only through access to formal education, knowledge-building, and skills acquisition that she could make positive impact for herself, her family, and the larger society.

Contributions of Nigerian Women Scientists to Nigeria's Development

Francisca Okeke FAS – *Laureate, L'Oreal-UNESCO Prize for Women in Science, 2013*

The importance of science and technology for development of any nation cannot be overemphasized; they are the keys to the prosperity of a nation. It is virtually impossible to expect significant economic, social, and environmental development without sound scientific research.

[2] Aina O. I. (2002). Alternative modes of financing higher education in Nigeria and the implications for university governance. *Africa Development*, 27(1&2): 236 – 262.

Results from research have proved that women have been neglected, and have not been given adequate attention. There is therefore urgent need to get women to fully participate in scientific research. Despite the challenges faced by women, some have made excellent achievements - just as their male counterparts - in various fields of science.

Professor Ayoka Olufunmilayo Adebambo is a renowned animal scientist at the Federal University of Agriculture Abeokuta (FUNAAB). Adebambo made history as the first graduate of Animal Breeding at the University of Ibadan, and the first female Professor of Animal Breeding and Genetics in Nigeria. She has conducted research on the improvement of indigenous pig breeds for commercialization and assisted local farmers in areas of pig farming. She established the FUNAAB Alpha Poultry Breeds Production project to drive her interest in the empowerment of women and the youth.

Professor Adenike Osofisan is the first Nigerian female to hold a doctorate in Computer Science, and the first female Professor of Computer Science in Africa. She made history as the first woman President and Chairman of the Computer Professionals Registration Council of Nigeria 2005 to 2009. She was the Pioneer President, Nigeria Women in Information Technology.

Professor Folasade Ogunsola FAS is a renowned medical scientist with specialization in the treatment and control of HIV/AIDS. Between 2004 and 2007, she was the Principal Investigator for the clinical trial of the HIV microbicide 6% Cellulose Sulphate in Lagos. She was the first female Provost of the College of Medicine at the University of Lagos. Her research activities were instrumental in setting up infection control programs in many institutions in Nigeria.

Professor Rabia Sa'id is a great inspiration for female scientists of the younger generation, particularly considering the area of Nigeria she is from. She was one of the winners of the Elsevier Foundation Awards for Early Career Women Scientists in the Developing World in 2015.

Professor Dora Nkem Akunyili was Director-General of the National Agency for Food and Drug Administration and Control (NAFDAC) of Nigeria from 2001 to 2008. Over 60% of drugs in Nigeria were fake before her assumption as the DG of NAFDAC. Her fight against fake drugs yielded fruit as the fake drugs market almost dropped nearly 100%; an achievement for the nation.

Challenges faced by women scientists in Nigeria include inadequate financing of fundamental research, as there is no definite evidence for their immediate benefit and applications. Also, there is a lack of collaborative research work both at national and international levels. Nigerian women scientists should be encouraged to engage in

international and national research collaborations, particularly with more advanced countries. They are to actively collaborate in translational research whose outcomes and impact on community are visible and quantifiable. Women are also encouraged to seek out and engage in public-private partnerships with industry for the use of their scientific products.

Key Discussion Comments

- Women are to be assertive. They should not wait to be called upon, but be ready to take up available opportunities in their career, especially when they are qualified for those opportunities
- The importance of mentorship cannot be over-emphasized in women's career progression. Women should be ready to seek out mentors and learn from them
- Building women's confidence and capabilities should start from the home at a young age. Parents are to teach the girl child to be assertive and commit to looking out for herself
- It is relatively more difficult to find female mentees in science fields. To address this mentorship challenge, women scientists are to deliberately promote one another, to create more awareness of their works and relevance to science

Session 2: Women Scientists for the SDGs

Nigeria and the SDGs: Where are We?

Ndidi Ozegbe **–** *Office of the Senior Special Assistant to the President on SDGs Nigeria (OSSAP-SDGs)*

On September 25, 2015, member states of the United Nations, including Nigeria, adopted the Agenda 2030 for Sustainable Development at the 70th Session of the United Nations General Assembly, with a set of Sustainable Development Goals (SDGs). The 2030 Agenda for sustainable development envisions a present and a future that is economically sustainable, socially inclusive, and environmentally resilient. The 17 Goals, also known as the Global Goals, are a universal call to action to end poverty, safeguard the planet, and ensure all people enjoy peace and prosperity by the year 2030. The 2030 Agenda comprises of 17 Goals, 169 Targets, and 230 Indicators. The 17 Goals are outlined in the figure below.

Figure 1: The 17 Sustainable Development Goals

There are many avenues through which development partners can play vital roles in supporting the SDGs implementation. These include, but not limited to:

- Filling the financial gap through traditional aid (grants and loans);
- Facilitating access to new financial instruments such as the Green Bond/Green Climate Fund;
- Promotion of foreign direct investment;
- Providing technical assistance;
- Capacity development and expertise in specific areas;
- Promotion of economic diversification and inclusive growth;
- Promotion of STI to support the implementation of the SDGs.

At the national level, the OSSAP-SDGs is working closely with federal ministries, departments, and agencies to ensure the SDGs are mainstreamed into their sectoral plans and policies. The OSSAP-SDGs is also supporting the states and local governments to mainstream the SDGs into their policies and medium-term development plans, in partnership with the United Nations Development Programme (UNDP). Sensitization and advocacy visits by the Senior Special Assistant to the President (SSAP-SDGs) and the UNDP Resident Coordinator to state governors on SDG mainstreaming, are currently on-going. The Federal Government of Nigeria has integrated the three dimensions of the SDGs – economic, social, and environmental – into the Economic Recovery and Growth Plan (ERGP) 2017-2020. Core areas of the SDGs such as food security, agriculture, energy, infrastructural development, industry, macroeconomic stability, and inclusive growth are given special attention.

High level sensitization and advocacy activities have been undertaken across the country, and with various stakeholders such as the state governors, lawmakers, traditional institutions, faith-based organizations etc. The awareness process targets key institutions and decision makers for the purposes of ensuring seamless policy integration, and forging the enabling environment for mainstreaming and implementing the SDGs. Various initiatives such as the National Youth Service Corps (NYSC)-SDGs Champions Programme and the SDGs Ambassadors Initiative are in place to facilitate nation-wide and community-based continuous sensitization on the SDGs. Also, the SDGs have been translated into the 3 major languages; Igbo, Hausa, and Yoruba for better awareness.

The SDGs are an ambitious, multi-dimensional, and inter-linked set of goals that cannot be achieved without effective, appropriate, and inclusive application of STI. For the SDGs to make transformative impact, the crucial role of science, technology, innovation, and research cannot be overemphasized. Technology, innovative ideas, and sustainable solutions are pivotal in tackling the global challenges of our time. To make significant progress in the implementation of the SDGs, our development efforts must comprehensively integrate STI into our strategies and plans.

According to statistics, the female population constitutes about 49.2% of Nigeria's Population (NBS, 2018). When we have more women in science, we have more educated, more economically empowered women, thus addressing SDGs 4, 5, 8, and 9. When we have more women as scientists, innovators, engineers, medical practitioners, researchers, these global challenges can be adequately addressed. More women and girls should be encouraged to pursue careers in STEM, ICT, etc. Successful women professionals should mentor younger women and girls to pursue careers in science fields.

In conclusion, Nigeria has demonstrated strong commitment towards the Agenda 2030 for Sustainable Development. Institutional frameworks have been established at the national and sub-national levels to support the effective implementation of the SDGs. In order to achieve this transformative agenda that promises to "Leave No One Behind", technology, innovative ideas, as well as sustainable solutions are paramount. Agenda 2030 is clear that achieving gender equality and women empowerment is not only a crucial goal in itself but a catalyst for achieving the rest of the goals. Concerted efforts must be made by all stakeholders to ensure gender equality across many fields that are currently being dominated by men. In the rural areas, more efforts should be made to eliminate gender stereotypes and discriminatory practices that limit the potentials and advancement of women and girls.

Towards the Achievement of the SDGs: How can Women Scientists Contribute?

Jackie Kado - *Executive Director, NASAC*

To achieve the SDGs, it is necessary to engage key actors and communities, especially young female researchers and early career scientists, such as in the Nigerian Young Academy (NYA) and Global Young Academy (GYA). Scientists are to target focused discussions with champions and relevant stakeholders in government and industry. The relevance of trans-disciplinary research cannot be over-emphasized. Women scientists are to lead in integrated or transdisciplinary research for the SDGs. Scientists should

deliberately engage in networking, mentorship, science-policy dialogues, and other such activities, and participate in women for science, and science education programmes.

The SDGs, particularly SDG-5 (Gender Equality), should be contextualized in national policies and programmes. Focus should be placed on solution-oriented approaches that lead to collective action and reduce resource duplication and wastage. All concerned stakeholders (academia, policy, public) are to be involved from the onset of SDG-related initiatives. The long-term sustainability of these initiatives is to be addressed upfront to reduce the possibility of project failures.

Lessons learnt from SDG initiatives are to be documented and disseminated via relevant publications to contribute to the body of knowledge. For example, the "Women in Science, Inspiring Stories from Africa" was launched at the International Forum on Women and Sustainable Development in Africa, in March 2018 in Dar es Salaam, Tanzania, by the Women for Science Working Group of NASAC, and then disseminated in local schools. Such products on women scientists should be extended to other academies globally to further stimulate collaboration with such scientists in and outside Africa.

In a nutshell, women scientists must:

- Seek opportunities for collaboration and partnership with regional bodies like the African Union, East African Community, Common Market for Eastern and Southern Africa (COMESA), and Southern African Development Community (SADC); UN-agencies such as UNESCO, United Nations Environment Programme (UNEP), United Nations Economic Commission for Africa (UNECA), and other partners on the continent on various activities
- Determine better ways to engage the private sector on SDGs and specifically SDG-5
- Raise awareness among peers to consistently apply the gender lens in all local and regional SDG initiatives
- Speak up, take the lead, and participate in SDGs discussions, as well as champion contextual implementation of development initiatives.

Key Discussion Comments

- Science communication to deliver science for society or science for policy cannot be done in classrooms or research labs. Scientists are to take steps to engage with relevant stakeholders in government and in industry. This would ensure that science research is market/society-driven, and can therefore lead to national development

- To realize the SDG targets, the SDGs are to be incorporated in local and state government development frameworks, and their gender-related aspects taken into consideration

Session 3: Women as Drivers of Economic Development
Panel Discussion

Panelists

- Osu Otu (Lead Panelist) – *National Programme Officer, United Nations Industrial Development Organization (UNIDO), Nigeria Regional Office*
- Folakemi Cole-Adeife – *Director, Ayuna Group; Co-founder DENSA App*
- Gloria Elemo – *Former Director-General, Federal Institute of Industrial Research, Oshodi (FIIRO)*
- Umana Nnochiri – *Lecturer, Cross River University of Technology*

Lead Remarks: Women, STI and Economic Development

SDGs 4 and 5 deal with achieving quality education and gender equality respectively. Human development indices are used as measurements of the development of a nation. Going by the current trends in primary school attendance by girls, business ownership, political participation, etc, Nigeria still has a long way to go in achieving SDGs 4 and 5.

Nigeria cannot achieve the sustainable development goals if it fails to confront the tough but surmountable challenges facing STI in the country. Specific to women are cultural barriers inhibiting women from participating in STI. Policy makers and decision makers in government, academia, and industry need to confront and deal with these challenges. The main challenges within the STI-Education sector in Nigeria include lack of quality education, inadequate manpower, brain-drain, as well as the inability of Nigeria to bridge the gap between academics/research outputs and the society. These challenges hinder science from translating into actual national development.

STI is essential to drive economic growth and development. Well-articulated policies are in place to drive national development. But the nation has to go beyond policy documents to actual implementation of these policies. There needs to be implementable action plans to train and develop the manpower necessary to drive STI for national development.

Globally, women are under-represented in STEM. Girls are either not in school, or drop out early. Sustainable development requires science and scientists to drive the SDGs. Women play a central and vital role in society. Although women make up about 50% of the global population, they have access to relatively fewer resources than men.

Women are at the core, and not just part, of development. The contributions of women to science ultimately lead to economic development. Appropriate STI policies can enhance women's contribution to economic growth and development. Gender mainstreaming is therefore necessary to make STI policies more effective, and ensure that women's perspectives are considered in the policy formulation process. Men also have a role to play in championing the leadership of women, as well as supporting social, political, and cultural systems that empower women.

Panelists' Remarks

Most of the jobs of the future require ICT and digital skills, and so women need to be adequately equipped in STEM in order not to be left out in potential future employment. More so, the Nigerian academia must evolve beyond basic research to translational, demand-driven research that would be useful in solving national problems, and would also be relevant in a rapidly advancing technological world. The industrial/private sector is not left out. They are encouraged to partner with universities to help bridge the gap between theory and practice, especially in engineering and other technical fields. Women are also encouraged to leverage on technology and the ample resources it provides, such as free online courses, to develop intellectually, so as not to be relegated to redundant jobs such as secretarial and office keeping jobs.

Steps can be taken to ensure a more gender-inclusive society such as:

- Promoting flexible work conditions for women
- Reducing the glaring gender disparities especially in engineering and technical fields
- Integrating gender dimensions into national policies
- Ensuring equal access to resources to enable women access skill and learning opportunities, as well as funding
- Removing regulatory, legal, and social barriers to women in STEM
- Older, more established women should act as role models for younger women and girls
- Advocacy for women scientists by civil society and development organizations

Finally, the government needs to show a strong commitment to STI by including science experts in key government advisory roles. Also, intellectual property protection policies should be strengthened to encourage researchers, and ensure that research outputs are economically viable.

Key Discussion Comments

- Relevant government agencies, such as the National Universities Commission (NUC), should take their regulatory roles seriously. An efficient quality assurance system in higher education institutions should be in place to ensure that the quality of research done is commensurate to the level of education. Audits of facilities and infrastructure in Nigerian universities should be regularly carried out. Special attention should be placed on the availability and condition of laboratory equipment in science faculties, and appropriate sanctions placed on defaulting universities
- Primary and secondary school teachers are to be trained in effective teaching methods. Integrating gender-appropriate tools into pedagogical methods such as illustrations is especially relevant at the basic levels of learning so as to catch the interest of young girls in education, and particularly in science
- The quota system may be a useful tool in attaining gender balance and including more women in government and political positions
- Social media can be used as an effective tool for disseminating science information to the public and showcasing women in science as motivators
- Women should remember that the key to relevance is collaboration, not competition!

Session 4: Women in Science: Policies, Programs, and Practices Panel Discussion

Panelists

- Enang Moma (Lead Panelist) – *UNESCO Regional Office, Abuja*
- Eucharia Oparah – *Acting Director-General, Nigerian Institute of Leather and Science Technology*
- Ahmed Hamdy – *Executive Director, African Union Scientific, Technical and Research Commission (AU-STRC)*
- Angela Muruli – *Programme Analyst, UN Women Nigeria*

Lead Remarks – STEM and Gender Advancement (SAGA) Project

STI has a crucial role in meeting all the SDGs; so does gender equality. Reducing inequality by attracting more women into STI fields will support the achievement of many of the SDGs' targets especially 4 (quality education), 5 (gender equality), 9 (industry, innovation, and infrastructure), and 17 (partnerships for the goals).

Under-representation of women in STI translates into the loss of a critical mass of talent. By working towards these goals and harnessing women's full potential in STEM fields, countries will reach higher levels of development, increase their research output, and build capacity, thereby reducing inequalities and knowledge gaps. This, in turn, will enable countries to achieve many other STI-based SDG targets.

Gender equality is one of UNESCO's two global priorities; with a commitment to promote equality between women and men across the organization's mandate. UNESCO mainstreams gender equality across all of its programmes, and implements gender-specific programming in the sciences, culture, education, communication, and information sectors.

Some of the challenges in this regard are:

- Lack of information on drivers and barriers to careers in STEM
- Lack of sex-disaggregated data in general
- Limited availability of methodology for evidence-informed policy-making

Given its mandate in science and its global priority on gender equality, UNESCO has a key role to play in taking up these issues, and working to overcome gender disparities in access to, influence over, and use of STEM.

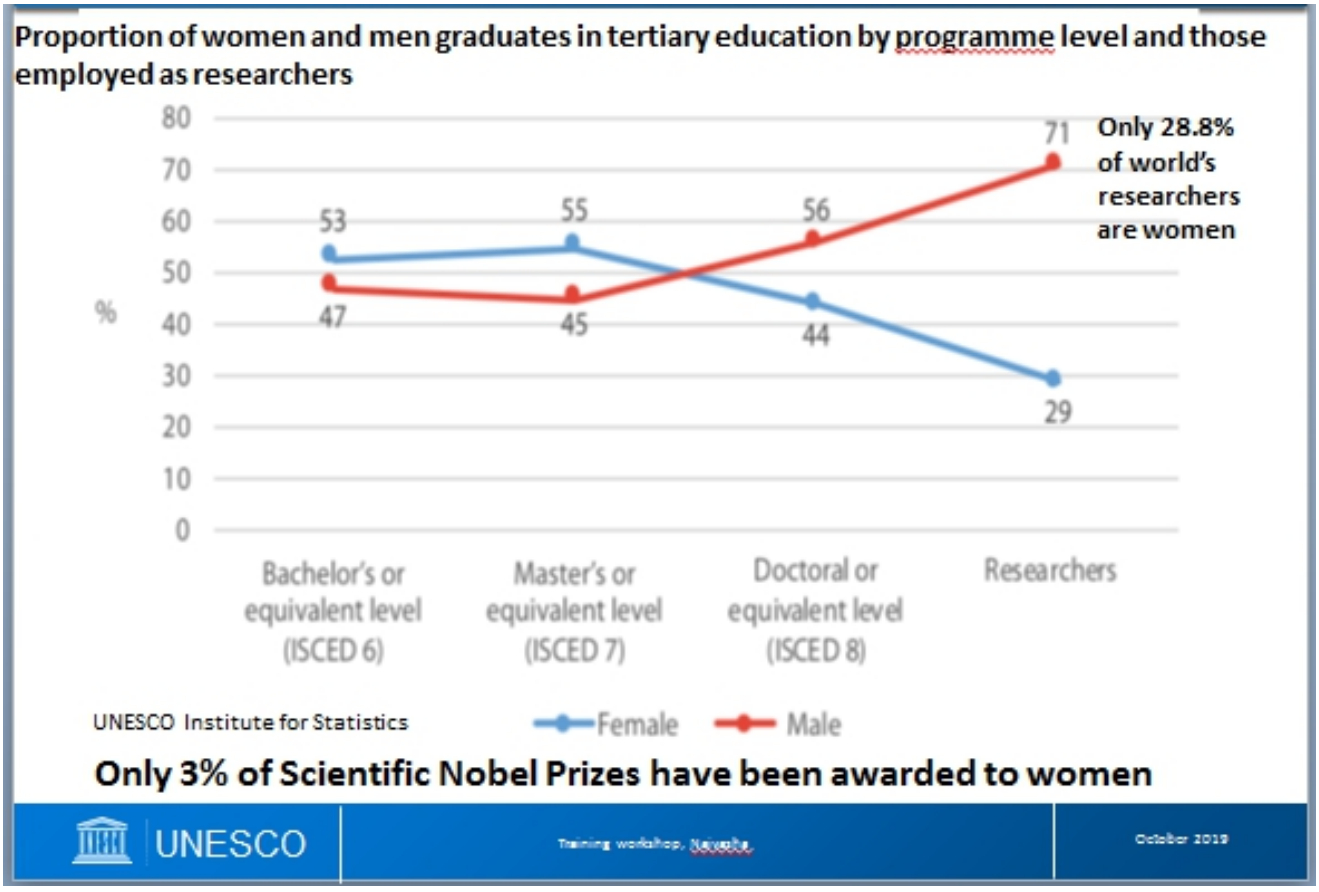

Figure 2: Proportion of men and women in education and research

The SAGA Project is helping countries to reduce the gender gap in STI at all levels of education and in research by building capacity for the collection of data on gender in STI; improving the measurement and evaluation of the situation of women and girls in STI; and identifying gaps in the policy mix and improving national STI policies related to gender.

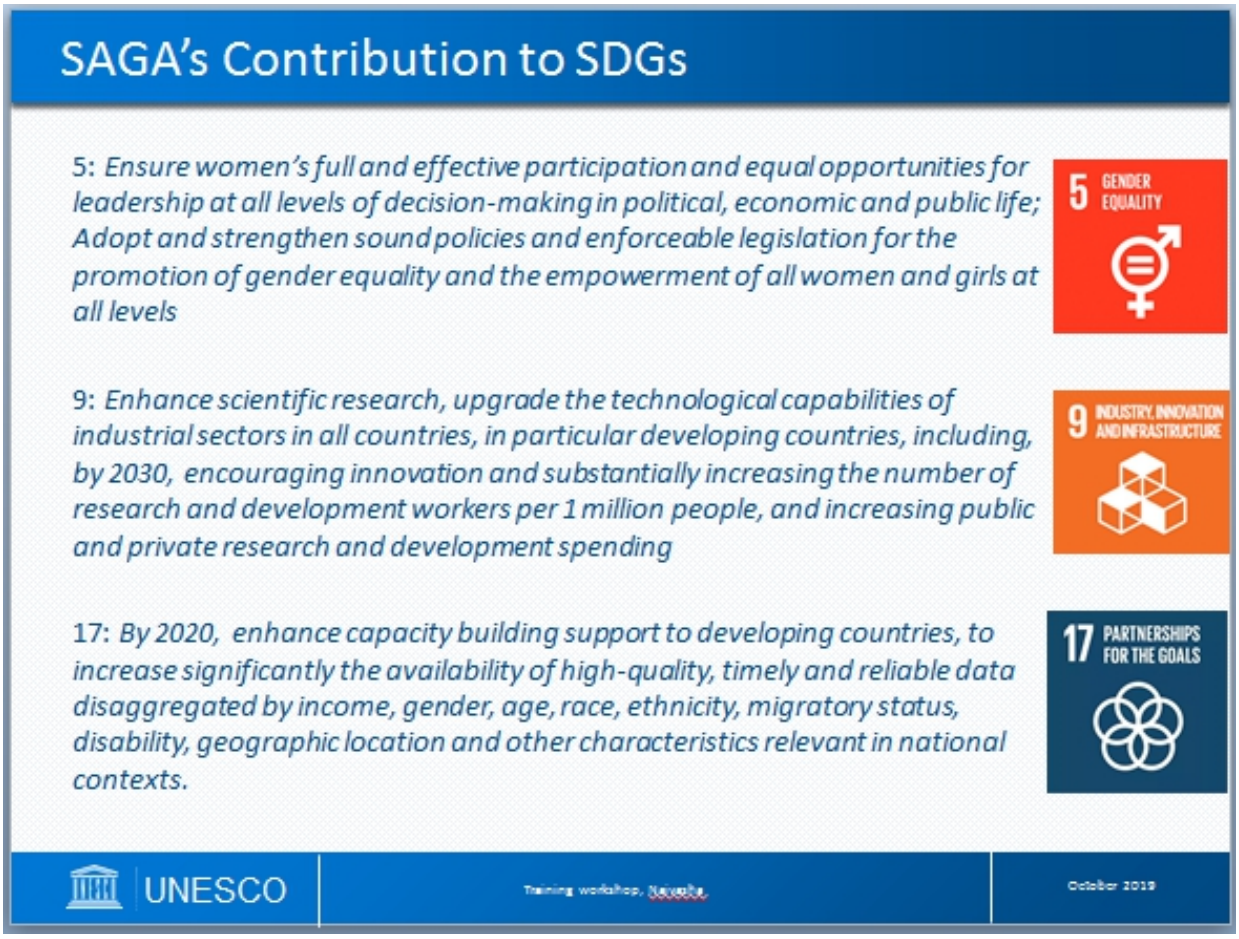

Figure 3: SAGA's contributions to SDGs

Changing perceptions, social norms, and stereotypes towards women in STEM may be achieved by:

- Promoting awareness of and overcoming non-conscious and cultural gender biases widely expressed as gender stereotypes, among scientists, educators, policy-makers, research organizations, the media, and the public at large
- Promoting the visibility of women with STEM qualifications and in STEM careers, especially those in leadership positions in governments, business enterprises, universities, and research organizations
- Mainstreaming gender perspectives in science communication and informal and non-formal STEM education activities, including in science centres, and museums.

Panelists' Remarks

From gender disparity to gender equality

In Africa, women and girls constitute 60% of the illiterate population. Empowering women through education is an important factor in promoting the socio-economic well-being of Africans. This can be achieved by developing policies that address social and cultural norms around girls' schooling, and that take rural and marginalized populations into consideration.

Gender mainstreaming, for long, has been a central focus of many international organizations and African Union member states given the knowledge that the society we live in is not gender-balanced, often favouring one gender over the other. In 2008, the African Union Commission's Department of Human Resources, Science, and Technology, in the implementation of its programmes on science, realized that recognizing and appreciating the contribution of women scientists to the scientific community on the continent will promote their participation. This gave rise to awards such as the Kwame Nkrumah Regional Award for women scientists.

The full inclusivity of women in development processes and in all sectors does not only ensure the efficiency and effectiveness of systems, but maintains the inherent right of women to contribute to their communities and ensure their own independence.

Strategies to support (attract and retain) women in science

- Capitalizing on alumni networks and mentorship: It is so important for academic institutions, especially secondary schools and even primary schools, to invest in the alumni networks especially with past female students. It is enriching and empowering for young women who may just need one example to show them that a career in STEM is not only possible, but can be rich, dynamic, multi-dimensional, and not restricted to just medicine or engineering. Other formal programmes should be considered for mentorship of young women from their early years

- Enrichment in the form of STEM clubs, extracurricular clubs, and celebrating significant days such as the International Day of Women and Girls in Science in an inclusive and encompassing manner: These kind of fun, innovative activities not only inspire the next generation of women in STEM, but they deconstruct the myth that STEM subjects are difficult and only suitable for certain people and this can encourage more women to enter the field

- Establishing gender-sensitive boards, and inclusive student bodies which support and incorporate the opinions of women: This would create an enabling environment where women can thrive and, in turn, contribute more positively to science and to society.
- Institute fellowships, grants to support a return to academics or research for women who have taken career breaks due to parenting/childcare (e.g. https://womenreturners.com/resources-for-scientists/)
- Commission a platform/hall of fame/book to celebrate, showcase and encourage women in science who have distinguished themselves in various fields from medical scientists to Arts/Humanities across Nigeria annually
- Encourage relevant industries to institute awards for outstanding girls and women in science
- Great women scientist should be included in history lessons/SDG education in secondary schools include in comments

Key Discussion Comments

- Nigeria should adopt best-quality approaches from other countries, that have achieved gender parity in their policies, and adopt those practices
- Women are to be confident and not reluctant to aspire for leadership positions, especially when they are qualified for those roles

Session 5: Women in Science - Challenges and Opportunities

Overcoming the Gender Bias in STEM- Related Fields

Eno Ituen *– Pioneer President, Organization for Women in Science for the Developing World (OWSD), Nigeria Chapter*

Many scholars and policymakers have noted that the fields of STEM have remained predominantly male, with historically low participation among women since the origins of these fields. According to a 2005-2006 survey, 24% of full professorship positions at all US institutions were held by women, while men held about 76%.[3] Also, relatively low percentages of women were in the most prestigious and highest paid faculty jobs.

Unfortunately, in Nigeria, it is difficult to obtain reliable nation-wide data on women in STEM fields. Such data should form the basis of national policies to address the issue of gender disparities in academia, and STEM fields in particular. Aggregate figures from international agencies do not tell much, especially since terminology describing educational levels, content of majors, job categories, and other markers varies from country to country[4].

Some reasons for the continued low representation of women in STEM fields include:

- Societal barriers: Cultural, religious, and social norms that limit the full participation of women in relevant aspects of society
- Psychological factors such as lack of confidence and the imposter syndrome: Girls are generally brought up to believe that STEM fields are 'masculine', and so they steer away from STEM fields because they believe they are not qualified for them.

[3] Gender Bias in STEM: Why does Gender Bias in Academia and the STEM Fields Matter? Available at https://toolsforchangeinstem.org/gender-bias-in-stem/

[4] Ann Hibner Koblitz (2016). Life in the fast lane: Arab women in science and technology, *Bulletin of Science, Technology & Society*, 36(2):107–117.

Figure 4: Societal barriers faced by women

One of the proposed methods for alleviating the stereotype threat is through introducing role models. Role models do not necessarily have to be individuals with authority or high status, but can be drawn even from peer groups. Providing institutional encouragement and support is necessary to support and engage young women and girls, with the aim of preventing them from dropping out in the early stages of schooling or work. This can be done by promoting interaction with high school students through workshops and seminars; and providing professional support networks for women in the workplace. Organized efforts by development organizations, civil society groups, and industry are also instrumental to attract and retain girls and women in STEM.

Engaging Girls/Young Women in Science

Edu Inam – *Fellow, Schlumberger Foundation Faculty for the Future Program*

All over the world, there is the phenomenon of the "leaky pipeline" of lost talent. Girls are attracted to science at primary/secondary school and make up most of science graduates with bachelor's degrees. Even at master's level women are in the majority. But at higher levels of research, women tend to drop out.

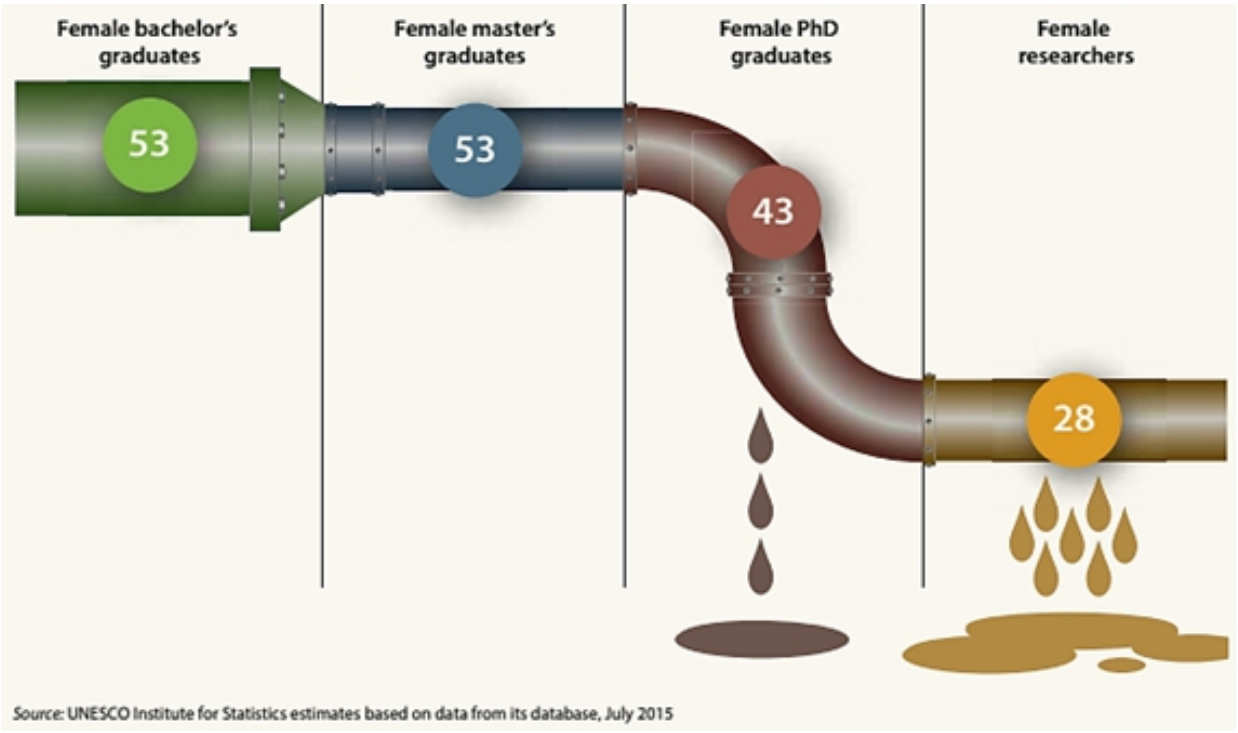

Figure 5: The leaky pipeline in higher education and research

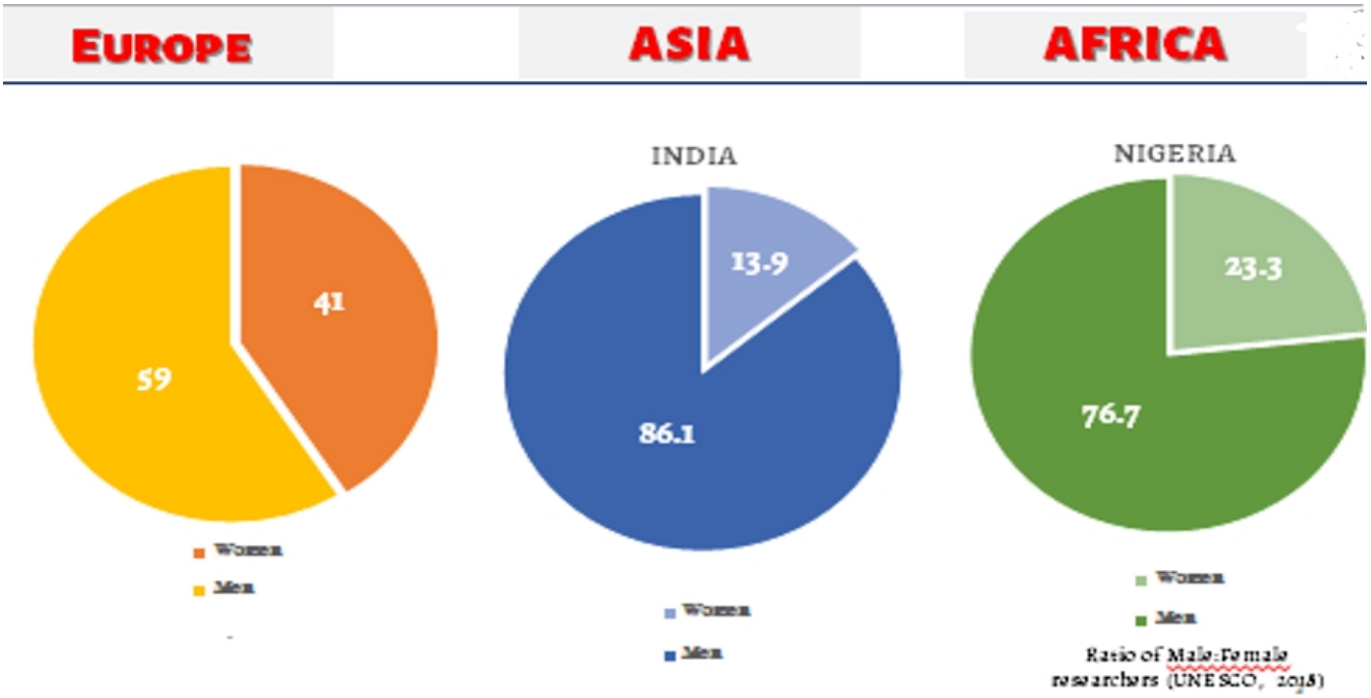

Figure 6: The ratio of male and female researchers globally

Some strategies to engage more women in STEM include:

- Involving women in STEM educational policy development
- Career counselling and gender-sensitive mentoring
- Gender-responsive teacher training in STEM-related subjects, as well as increasing the number of female teachers in STEM-related subjects
- Increase initiatives such as scholarships to encourage young girls to develop interest in STEM and empower women through acquiring ICT skills
- Institute functional gender-based discrimination and sexual harassment preventive policies in tertiary institutions at all levels, including at Masters and PhD levels
- Promote gender equality in international mobility of students
- Sponsoring women to participate in STEM workshops, conferences, seminars, and exhibitions

- Research grants for women in STEM e.g. the Schlumberger Faculty for the Future fellowship
- Start-up funds for women in STEM entrepreneurs

Plugging the Leaky Pipeline in Women's Career Progression

Uduakobong Okon *– Chair, International Network of Women Engineers and Scientists (INWES) Africa Regional Network*

Gender gaps continue to exist in careers progression, despite all efforts of the United Nations to bridge the gaps by instituting development goals and strategies. Despite the pronounced commitment of the international community to gender equality and bridging gender gap in the formal political arena, reinforced by Convention on Elimination of All Forms of Discrimination Against Women (CEDAW) and the Beijing Platform of Action, women are still highly marginalized.[5] This position of women in the society in relation to men, and the resulting subordination, oppression, and marginalization has attracted the attention of scholars, activists, feminists, and development workers for a very long time. This marginalization forms a serious constraint to career women, and impedes their growth and efficiency. These also hinder women from achieving true parity in career development and progress in relation to their male colleagues.

Leaky pipelines imply resource wastage, and the resultant effect is retrogressive progression, or very slow/zero progression. This implies that the career pipelines for women are non-sustainable and unreliable. Women, specifically women scientists, are not showing the needed progression in their careers. The leaks in the pipelines of women progression are categorized under:

1. Political and Legal Leaks: These are various loopholes existing in the legal framework of many African countries. These leaks arise from the failure of these African countries to make implicitly gender sensitive laws, and the lack of adherence to international charters, declarations, and conventions. The implication on the career woman is that, she may not see the need to aspire or progress; 'after all to what end?' It kills enthusiasm and builds up an 'l don't care' syndrome. Some women feel deprived and discriminated against, and seek to express their concerns without having appropriate response or backing by the customary law such as those barring women from owning

[5] United Nations Development Programme (UNDP) Report, 2005

landed property. In most countries, women in STEM careers would have fared better if gender laws and policies addressed their need to operate within a legal framework that is not biased in favour of the male counterparts.

2. Economic Leaks: Despite the fact that women are involved in 80% of wealth creation activities in the African economy, their poverty level has not changed. This is largely due to trado-cultural restrictions, and lack of access to finance/business capital.

3. Educational Leaks: Education is one of the most important means of empowering anyone, including women, with knowledge, skills, and self-confidence necessary to participate fully in the development process. Lack of proper and quality education is like a cankerworm that eats deep to destroy the fabrics of life. Plugging the leak means educating girls and women. Life-long education is also important; continuous exposure of the career women to current developments in their various fields of science and technology is invaluable. A country's wealth or development index is measured by the percentage of its women population that is exposed to different career opportunities in the wealth creation chain.

4. Psychological Leaks

5. Sociocultural Leaks: Nigerian women are still struggling to find their way to break the "glass ceiling" imposed on them through the practice of patriarchy in the society. In many societies, women are perceived to be mere home makers and second-class citizens. Hence, there is the commonality of general belief system that the best place for women is in the "kitchen". This trend has brought about tremendous misrepresentation of women's rights, at the level of the family down to the society, and undermines their effectiveness in management positions.

Achieving change requires policy and programme actions that will improve women's access to secure livelihoods and economic resources, alleviate their extreme responsibilities with regard to housework, remove legal impediments to their participation in public life, and raise social awareness through effective programmes of education and mass communication. Some strategies for bridging the gaps existing in women`s career progression, with a view to facilitate the progressive development of women scientists and career women generally are:

- Government and international community should go beyond declarations, laws, charters, and conventions etc., to making it mandatory for member states and signatories to implement gender policies. They should come up with strategies that will enforce the implementation of these gender policies by the different countries. They should stipulate sanctions and penalties to erring states. The government

should both repeal and reform all discriminatory statutory and labour laws that are non-gender sensitive, and replace them with deliberate policies that are in line with gender mainstreaming.

- Promoting women and girls' education through scholarship awards, funding of professional development courses, research grants, and adoption of girl-friendly strategies in education etc

- Women on their part need to develop self-confidence and be assertive in carrying out management responsibilities, as well as demonstrate dedication and commitment to their professional responsibilities to gain parity with their male counterparts in management positions. Women have to re-assert themselves to achieve self-actualization, scaling over the different societal barriers on their career path.

The Balancing Act for the Nigerian Woman in Science

Tokunboh Odubanjo *– Consultant Pathologist, Lagos University Teaching Hospital*

The term work-life balance (WLB) means maintaining a balance between the time and focus given to the professional and personal lives of the career person.[6] Work-life balance is a method which helps employees of an organization to balance their personal and professional lives. The concept is relevant to both men and women. Ideally, the demands of an employee's career should not overwhelm the individual's ability to enjoy a satisfying personal life outside of the business environment.

The employment rate among women aged 25-54 years is up from 57% in 1975 to a record high of 78% in 2017.[7] As more women have begun to pursue employment outside the home, the society has often failed to acknowledge that the woman might require assistance with her duties at the home front. 63% of millennial women believe that having children will make it harder for them to advance their careers. 56% of working moms find it very or somewhat difficult to balance career and family responsibilities.[8] What other options then are available aside from work-life balance?

---

[6] https://www.mbaskool.com/business-concepts/human-resources-hr-terms/7045-work-life-balance.html

[7] Roantree B, Vira K: The rise and rise of women's employment in the UK (IFS Briefing Note BN234). Institute for Fiscal Studies. Available at https://www.ifs.org.uk/uploads/BN234.pdf

[8] Mollie Spilman (2015) Hey millennial women—let's get past the idea that career and family is either-or. Available at https://qz.com/449750/hey-millennial-women-lets-get-past-the-idea-that-career-and-family-is-either-or/

- Family over work?
    - The Nigerian career woman may be more inclined to choose this option due to her heightened sense of family and community as an African. This usually results in shortfall or failure to meet deliverables at work, negative appraisals, warnings, and/or job termination
    - Resign from job
- Work over family?
    - The burden of guilt and the society's condemnation of the career woman and her choices. This may result in 'mum guilt' - the feeling of guilt, self-doubt, anxiety, or uncertainty that is experienced by mothers when they feel that they are failing or falling short of expectations in some way.[9] This feeling of guilt may serve as a moral compass that can lead you to a reset of priorities. On the other hand, the guilt can be so overwhelming as to make effective work impossible.
- Work over personal life?
    - This option usually leads to workaholism and burnout, chronic stress, depression, anxiety, insomnia etc.

As the other options are unfavourable and unsustainable in the long run, it is best to balance work/career demands with personal priorities.

[9] https://www.activekids.com/parenting-and-family/articles/mom-guilt-is-real-here-s-how-to-beat-it#targetText=Mom%20Guilt%20is%20the%20feeling,phenomenon%20are%20numerous%20and%20intense

Key Discussion Comments

- The government should interface with scholarship boards and other grant-giving bodies for the benefit of Nigerian scientists. For instance, the OWSD removed Nigeria from its list of eligible scholarship countries. The government and national science academies ought to intervene in such circumstances
- Men are encouraged to support women at home and at the workplace to help them attain work-life balance
- Mentors provide a very strong support system. Every aspiring career woman should have a mentor. Also, women should not give in to discouragement if they fail
- Women should form the habit of setting goals (family-work-personal life) for themselves and periodically appraising themselves in the light of the goals they have set. Celebrate your achievements and don't dwell on your failures
- Seek or get help from family if necessary, to support with child care sometimes
- Be determined to succeed by thinking outside the box such as by utilising night times/shifts for work that cannot be accommodated because of child care during the day
- Learn the art and act of delegation of work and family duties to free space for personal reflections and relaxation some times.

Session 6: Women Leaders in Science

Panel Discussion

Panelists

- ***Folasade Ogunsola FAS*** (Lead Panelist) – *Deputy Vice-Chancellor (Development), University of Lagos*
- ***Chinedum Babalola FAS*** – *Vice Chancellor, Chrisland University*
- ***Abimbola Alale*** – *MD/CEO, Nigerian Communication Satellite Limited (NIGCOMSAT)*
- ***Olanike Adeyemo FAS*** - *Deputy Vice-Chancellor (Research, Innovation & Strategic Partnerships), University of Ibadan*

Lead Remarks – Women in Science: Opportunities and Challenges in Leadership

The Facts:

- Less than 30% of women, globally, are researchers in STEM fields
- Women in STEM fields publish less, are paid less for their research, and do not progress as far as men in their careers
- Only 17% of senior leadership positions in science (both in academia and in the private sector) are held by women
- Women are grossly under-represented in senior management in academia in Nigeria

Many countries of the world are making efforts to bridge the gap between men and women in politics and in other fields of human endeavour. Also, there is growing interest of young women in leadership and policy making. However, representation of women is still very low in Nigeria due to the following factors:

- Religion: Both Christianity and Islam do not accord women much role in public life. Women are required to be submissive and images of virtue. They are expected to be seen not heard

- Patriarchy and cultural barriers: Stereotypes created by cultural norms about leadership often show up at work and limit the roles available to women. These stereotypes are not only perpetuated by, but are often internalized by women and lead to unconscious and conscious bias. Women are seen as wives and the weaker sex, are considered less competent, and are not to be a part of the decision-making process. Therefore, even when women manage to attain senior positions, their decisions are often challenged at the workplace

- Social factors such as isolation and fewer role models to look up to. Due to extra responsibilities at the home front, women have less time for networking and building the social capital needed for collaborations and other productive work relationships

- Male-dominated professions in many STEM fields

- Lack of self-confidence: Internalized social norms which dictate that women are inferior or do not belong in the public space results in women holding themselves back from leadership positions even when they are qualified.

Panelists' Remarks

Although women have striven to distinguish themselves academically, men still occupy most top leadership positions in research/academia. There is therefore a need to support women to take up such positions by addressing the gender issues at the primary levels of education, mentor young girls and women through tertiary education, as well as provide opportunities for collaborations to enable them progress up the academic ladder.

According to Randell and Gergel (2009)[10], attention to gender equality in STEM is an effective development strategy without which the world has no chance of achieving many of the ambitious health, social, and development targets it has set for itself. Essentially, no meaningful development can be achieved by a nation if development is tied to a particular gender.

[10] Shirley K. Randell and Diana R. Gergel (2009). The Education of Girls in Africa. Opening address presented at the Federation of University Women of Africa Conference, Lagos, Nigeria, July 2009

Key Discussion Comments

- Women need to develop their social capital and leadership abilities. Women should seek out and join relevant professional associations, academies, networks, and be advocates for change
- Hard work, consistency, and dedication to work would make a person stand out and be respected, irrespective of gender
- A leader is an ambassador of her organization. She is to build and maintain relevant work relationships
- Research group leadership training and support for women scientists, particularly early-mid career women scientists, should be encouraged in institutions
- Institutionalised/formal mentorship of women scientists for administrative, political, advisory, board membership, directorship and/or senior positions in academics, industry and governance should be encouraged

Session 7: Mentorship and Collaboration among Nigerian Women Scientists
Interactive Session

Panelists

- ***Eucharia Nwaichi*** (Lead Panelist) – *2013 L'Oreal-UNESCO Fellow*
- ***Abidemi Akindele*** – *College of Medicine, University of Lagos*
- ***Anne Asuquo*** – *University of Calabar*
- ***Isoken Igbinosa*** – *Nigerian Young Academy (NYA)*

Lead Remarks: Building Science Networks for Women and Girls

While the term "network" often is used loosely to incorporate all coordination that is not hierarchal, there are three types of network coordination that rely on voluntary participation and mutual trust in order to succeed: partnerships, networks, and collaborations.

Partnerships occur when two entities (e.g. public or private organizations) agree to work together to meet a mutually decided goal. Benefits include flexibility and adaptability, as well as the ability to adjust quickly to meet the changing environmental demands of STEM fields.

A successful system is built on interdependency, trust, and sharing of credit for successes (Agranoff, 2004). Developing trust among agencies is done by mutual learning and action in a network. The actions that most build trust are the completion of accepted assignments, follow-through, and commitment to the cause.

Science networks have given direction, interest, and the right attitude to many women and girls in many parts of the world especially in the developed world. Strategies that involve resources and exemplary practices have shown to be productive, as they provide a simple, educational approach, rooted in what research has revealed engages girls in STEM. Early career women need mentors and support networks (including men) for their science ambition. They can call on these for support, inspiration, and reassurance especially when family, peer, and societal pressure mount.

Over 70 million of Nigeria's population comprises women and girls, and their exclusion from the generation and application of scientific knowledge is tantamount to a tremendous waste of the nation's human potential. Information technology has played a significant role in finding and connecting with role models and should be consciously leveraged on. There is a burning need to do outreach or partnership development to create and foster growth of women STEM networks and support created networks. These, by extension, will trigger much-desired collaborations, as well as engender national development and social equality.

Session 8: The Way Forward: Empowering Nigerian Women Scientists

General discussion

The various challenges faced by women have been highlighted in previous sessions. To address those challenges, the following strategies for empowering Nigerian women scientists have been identified by the summit participants and categorized into three:

4) Individual women scientists
    g. Develop self-confidence to be able to take on higher responsibilities.
    h. Learn from successful women scientists, who are successfully balancing work and career (seek for mentorship).
    i. Be diligent and work hard.
    j. Be focused.
    k. Mentor other young women/girls.
    l. Join relevant networks

5) Institutions (government, private sector, academia):
    a. Institutionalize formal mentoring for female scientists.
    b. If not in existence, gender and sexual harassment policies should be developed, and enforced.

6) The NAS
    The NAS should advocate for:
    a. Policies which encourage girls to take STEM subjects in primary and secondary schools, including:
        - Capacity building for STEM teachers in appropriate pedagogy for effective delivery (making STEM learner-friendly)
        - Strengthening laboratory facilities and exploring the use of science kits to make STEM learning interesting
        - Introducing STEM-based clubs, career talks, and counselling in schools
        - Providing tertiary education scholarships for outstanding girls in STEM

    b. Policies which support the recruitment and retention of female scientists, including:
        - Research grants targeting female researchers

- Age-flexible PhD training/support
- Science/research grants for females who have taken career breaks due to child care/parenting

c. Celebrate and provide visibility for women and girls excelling in STEM:
    - Celebrate the International Day for Women in Science in an inclusive way
    - Institute awards and prizes for outstanding girls in secondary and tertiary institutions, as well as early career women scientists, such as the AU Regional Prize for Women

Appendix

i. Summit Participants list

S/N	NAME	AFFILIATION
1	Abidemi Akindele	University of Lagos
2	Abimbola Alale	Nigerian Communication Satellite Limited
3	Abimbola Arise	University of Ilorin
4	Abubakar Sambo FAS	Usman Danfodio University
5	Abutu Bridget	University of Abuja
6	Adaku David	Federal Ministry of Science and Technology
7	Adijat Jimoh	National Biotechnology Development Agency
8	Agatha Henry-Ajala	University of Lagos
9	Ahmed Hamdy	AU-STRC
10	Akande Ganiyat	University of Abuja
11	Akor Jennifer	Federal Ministry of Science and Technology
12	Alex Azuka	African University of Science and Technology
13	Ameh Ugbede	University of Abuja
14	Amina Ahmed El-Imam	University of Ilorin
15	Angela Muruli	UN Women
16	Angie Olanipekun	NAS
17	Anne Asuquo	University of Calabar
18	Anosike Esther	African University of Science and Technology

19	Aregbesola Busayo	University of Abuja
20	Arikawe Bukola	National Biotechnology Development Agency
21	Asifau Idris	Federal Ministry of Science and Technology
22	Assia Abubakar	African University of Science and Technology
23	Azah Daisy-Clay	African University of Science and Technology
24	B. C. Akin-Osanaiye	University of Abuja
25	B.T. Olowookere	University of Abuja
26	Babalola Tosin	Directorate of Technical Cooperation in Africa
27	Blessing Onyema	NAS
28	Chiagozie Kafidipe	Nigerian Institute of Leather and Science Technology
29	Chidi Ibe FAS	NAS
30	Chinedu Babalola FAS	Chrisland University
31	Chinwe Chukwudi	University of Nigeria/ Nigerian Young Academy
32	Chioma Ejikeme	University of Nigeria
33	Dennis Agbonlahor FAS	NAS
34	Doyin Odubanjo	NAS
35	Edeh Vincent	Daily Times News
36	Edu Inam	University of Uyo
37	Effiong Bassey	African University of Science and Technology
38	Egbulefu Chidinma	National Biotechnology Development Agency
39	Ekaette Inam	N/A
40	Ekanem Braide FAS	NAS
41	Enang Moma	UNESCO

42	Enefe Ndidi	University of Abuja
43	Eno Ituen	University of Uyo
44	Etekume Chukwutem	African University of Science and Technology
45	Eucharia Nwaichi	University of Port-harcourt
46	Eucharia Oparah	Federal Ministry of Science and Technology
47	Ezeagu Ijeoma	African University of Science and Technology
48	F. O. Oyelowo	University of Abuja
49	Folakemi Cole-Adeife	Lagos State University Teaching Hospital
50	Folasade Ogunsola FAS	University of Lagos
51	Francisca Okeke FAS	University of Nigeria
52	Gertrude Ogieguata	NAS
53	Gina Ihekueme	African University of Science and Technology, Abuja
54	Gloria Elemo	Federal Institute of Industrial Research, Oshodi
55	Halima Yusuf	African University of Science and Technology
56	I. C. Chibuagwu	University of Abuja
57	Ibrahim Damilola	African University of Science and Technology
58	Ifeoluwa Oyeyemi	University of Medical Sciences
59	Igili Andrew	Nigerian Institute of Leather & Science Technology
60	Ihuoma Chiedozie	Punch Newspaper
61	Igwilo Chiamake	African University of Science and Technology
62	Isoken Igbinosa	Nigerian Young Academy
63	Itohan Ojeaga	African University of Science and Technology
64	Iweajunwa Sarah	National Biotechnology Development Agency

65	Jackie Kado	Network of African Science Academies
66	Jackson Asanga	Directorate of Technical Cooperation in Africa
67	Joy Atawodi	Ahmadu Bello University
68	K. Mosto Onuoha FAS	NAS
69	Kayode Adebowale FAS	NAS
70	Koji Francisca	Federal Ministry of Science and Technology
71	L. O. Okwute	University of Abuja
72	Lawal Ramota	University of Abuja
73	Lily Oriero-Oviemuno	OSSAP-SDGs
74	Maria Apochi	University of Abuja
75	Maduagwuna Chinonye	University of Abuja
76	Maria Chinyerem	African University of Science and Technology
77	Marie Johnson	AU-STRC
78	Maryam Alka	African University of Science and Technology
79	Ngasoh Odette	African University of Science and Technology
80	Nkechi Okere	University of Abuja
81	Nkechi Onyedika	Guardian
82	Nkiruka Odoh	University of Abuja
83	Numfor Linda Bih	African University of Science and Technology
84	O. T. Oyebode	University of Ibadan
85	Obianyo Ifeyinwa	African University of Science and Technology
86	Obioma Nwaorgu FAS	Nnamdi Azikiwe University
87	Ofojebe Adaeze	African University of Science and Technology

88	Ogbonna Chinaza	African University of Science and Technology
89	Ogunkuade Opeyemi	African University of Science and Technology
90	Okereke Lois	African University of Science and Technology
91	Okwesili Ngozi	University of Nigeria
92	Olabisi Aina	Obafemi Awolowo University
93	Oladimeji Salami	National Biotechnology Development Agency
94	Olanike Adeyemo FAS	University of Ibadan
95	Olanrewaju Comfort	University of Abuja
96	Olatunde Farombi FAS	NAS
97	Olatunji Aboyede	Federal Ministry of Science and Technology
98	Olayinka Asekun	University of Lagos
99	Olusegun Ekundayo FAS	NAS
100	Oluwatoyin Ajanaku	Covenant University
101	Oluwole Familoni FAS	NAS/University of Lagos
102	Oluyide Foluke	Ministry of Science and Technology
103	Omolara Yakubu	Covenant University
104	Onche Odeh	Independent Newspaper
105	Oseni Mercy	Federal Ministry of Science and Technology
106	Osuji Otu	United Nations Industrial Development Organization
107	Ozegbe Ndidi	OSSAP-SDGs
108	Peace Ofeoshi	Media
109	Peter Ajagbonna	University of Abuja
110	Rachael Zephaniah	Nigerian Institute of Leather & Science Technology

111	Raji Ayodamola	African University of Science and Technology
112	Richard Adegbola FAS	RAMBICON
113	Roseline Abah	University of Abuja
114	Salamatu Machunga-Mambula	University of Abuja
115	Saliu Halima	African University of Science and Technology
116	Samuel Shofuyi	NAS
117	Siyanbola Malomo FAS	FUTA
118	Solomon Isa	Federal Ministry of Science and Technology
119	Susan Etim	Cross River University of Technology
120	Ezenwafor T. C.	African University of Science and Technology
121	T. H. Farombi	University College Hospital, Ibadan
122	Tarimoboere Agbalalah	National Biotechnology Development Agency
123	Temitope O. Sogbanmu	University of Lagos
124	Tenuche Oremeyi	University of Abuja
125	Tokunboh Odubanjo	University of Lagos
126	Tolu Dada	News Agency of Nigeria
127	Tope Aiyedun	University of Abuja
128	Uduakobong Okon	University of Uyo
129	Uduak Luke	University of Uyo
130	Ukwuigwe Onyinyechi	African University of Science and Technology
131	Umana Nnochiri	Cross River University of Technology
132	Yakubu Nimota	African University of Science and Technology
133	Yashim Esther	Ahmadu Bello University

134	Ydo Yao	UNESCO
135	Zainab Abubakar	University of Abuja

ii. Summit Co-sponsors

THE NIGERIAN ACADEMY
OF SCIENCE

ACADEMY HOUSE
8A Ransome Kuti Road
University of Lagos, Akoka, Lagos.
P.M.B. 1004 University of Lagos Post Office
Akoka, Yaba, Lagos, Nigeria.
Tel: +234 808 962 2442
Email: admin@nas.org.ng
Website: www.nas.org.ng

9 789789 898695