African Population and Health Research Center
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Examining participation and quality of experiences of women in Science Technology Engineering and Mathematics (STEM): Postgraduate training programs and careers in East Africa.

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Report from the First Virtual Stakeholder Engagement Workshop

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The Africa Population and Health Research Centre in collaboration with IUCEA convened the roundtable discussion, which was moderated by Dr. Florah Karimi (APHRC). Different workshop sessions were facilitated by Dr. Catherine Kyobutungi, Dr. Anne Khisa and Dr. Evelyn Gitau. We would like to thank Juru Eglentine (IUCEA) for logistical support during planning of the stakeholder engagement workshop, together with the office of the acting Director, IUCEA for smooth liaison with and mobilization of various IUCEA member institutions who participated in the workshop. We are highly indebted to the institutions that were represented by our participants. We sincerely thank our participants for their candid contributions to the discussion. Hopefully, this is a first step in a series of several fruitful discussions regarding women in STEM in East Africa.

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Abbreviations

APHRC African Population and Health Research Center

CARTA Consortium for Advanced Research Training in Africa

CUE Commission for University Education

IUCEA Inter-University Council of East Africa

STEM Science Technology Engineering and Mathematics

Background

High quality post graduate training in Science, Technology, Engineering and Mathematics (STEM) related disciplines in sub-Saharan Africa (SSA) is important to strengthen the generation and uptake of research evidence to advance development and to ensure countries achieve the Sustainable Development goals (SDGs). However, barriers that hinder women from participating in STEM-related careers implies that half of SSA's potential is not being harnessed. Women and girls remain underrepresented in STEM due to gender stereotyping, lack of visible role models, and unsupportive policies and work environments. Therefore, there is a need to consolidate information on participation and experiences of women in STEM-related training and careers in SSA to identify appropriate interventions that will increase the participation in global development.

Project Objectives

Dr. Evelyn Gitau, Director of the Research and Capacity Strengthening Division at APHRC gave an overview of the IDRC Breaking barriers project. She highlighted the importance of supervision and mentorship to women's progress and retention in STEM training and careers, whilst explaining the difference between the two concepts. The primary objective of this study is to examine the participation and experiences of women in postgraduate training, and their subsequent recruitment, retention and progression in STEM careers in East Africa. A secondary objective is to establish the gender gaps in training and career engagement in select STEM related academic disciplines in East Africa. The study specific objectives and corresponding research questions are:

Objective 1: Determining the levels of gender equality in STEM-related post-graduate training and careers in East Africa.

1. Are there differences in gender distribution of students enrolled in STEM-related postgraduate courses at Masters and PhD levels?
2. Are there differences in gender distribution of students graduating from STEM related postgraduate courses at Masters and PhD levels?
3. Are there differences in gender distribution of faculty in the various STEM-related post-graduate disciplines at various academic levels over the last 10 years?

4. Which practices promote or hinder gender equality in STEM related postgraduate training and careers in East Africa?

Objective 2: Exploring the factors that contribute to participation of women in STEM related postgraduate training and careers in East Africa.

1. What challenges and barriers to leadership do women face in postgraduate STEM related training and careers?
2. What policies and guidelines influence women's participation in STEM post-graduate training in East Africa?
3. Which existing supervision and mentorship systems and structures promote quality postgraduate training and career paths among women in STEM related areas in East Africa?
4. Are there enough potential female supervisors and mentors who can act as role models?

Objective 3: Developing a comprehensive framework for optimal engagement of women in STEM related post-graduate training and careers in East Africa

1. What strategies and approaches provide for optimal engagement of women in STEM related post-graduate training and careers in East Africa?
2. What key performance indicators can be tracked to ensure women's success in STEM related careers?

The descriptive study will employ a mixed methods approach, including a scoping review, qualitative interviews and analysis of secondary data. Results will be synthesized to inform the development of an effective gendered approach and framework to improve participation and experiences of women in STEM training and career engagements in SSA. We planned a series of virtual stakeholder engagement workshops to obtain cooperation, incorporate views and concerns of stakeholders, and ensure successful implementation of the study. This report focuses on the deliberations of the first stakeholder engagement workshop.

Objectives of the First Stakeholder Engagement Workshop

The primary purpose of the first of a series stakeholders' engagement workshops was to create awareness of the first phase of the project which is a collaboration between the African Population and Health Research Center (APHRC) and the Inter-University Council for East Africa (IUCEA). Secondly, the forum presented opportunity for participants to brainstorm and share their specific experiences regarding participation and quality of experiences of women in various STEM postgraduate training programs and careers in East Africa.

Structure of Workshop

The workshop adapted a participatory and co-creation approach, where the facilitator presented thought provoking sessions followed by input and summary from participants. During the workshop, participants representing leadership of IUCEA member universities were introduced to study objectives and implementation plan. Thereafter, they were invited to brainstorm based on their experiences and share the true picture of the current status of 'participation and quality of experiences of women in STEM postgraduate training programs and careers in East Africa'. The final session allowed participants to validate the study research questions with a view of incorporating new and emergent areas of inquiry they deem relevant to the topic.

Barriers Hindering Women in STEM in Africa

The status of women in STEM in Africa is continually improving, albeit at a slower pace than the existing gap. Granted, women face various challenges whilst undergoing STEM training, and later on within their workplaces. It was therefore important to establish the current status of women in STEM on the

continent. In her opening remarks, Dr. Catherine Kyobutungi, the Executive Director of APHRC, welcomed everyone to the workshop and made a presentation that highlighted the place of women in STEM in Africa.

How Big is Africa – Really?

Catherine begun by showing maps of the world's continents embedded on the African continent to demonstrate how big Africa truly is (Figure 1)[1]. In terms of land area, Africa makes up to a fifth of the world. When it comes to population size, by 2015, Africa accounted for up to 15.9% of the world's population, by 2050, it is projected that Africa will account for 25%of the world's population and by the year 2100 Africa will account for 38.6% of the world's population. Between 2050 and 2100, the world population will increase by 1.3 billion; while Africa's population will increase by 1.8 billion[1].

Figure 1. The True Size of Africa[1]

STEM in Africa - Another way to look at it

Africa leads in HIV prevalence (Figure 2A)[2], if we were to take all the countries in the world and see how much they contribute to HIV numbers, the African continent will bulge out as shown on Figure 2B.

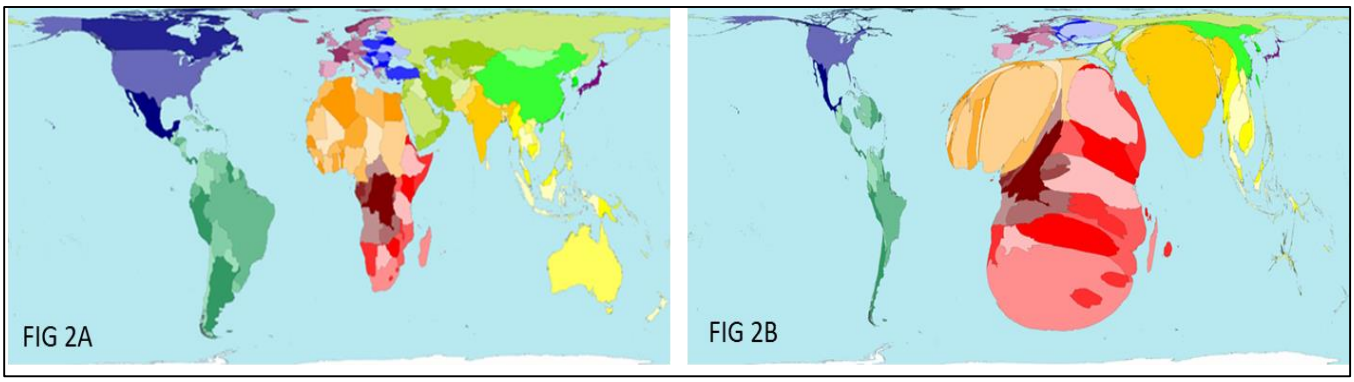


Figure 2. Global HIV Prevalence. FIG 2A depicts HIV prevalence per country and FIG 2B shows a cartogram of countries resized according to the number of people aged 15-49 who are living with HIV[2]

Asia on the other hand leads in teenage pregnancies but Africa is not doing much better in teenage pregnancy as shown in Figure 3[2] below. Teenage pregnancy is the future that is with us. We know what to do but many times we don't do as much as we should.

[1] http://insideoutpaper.org/wp-content/uploads/2013/05/continent_infographic-01-copy.gif
[2] http://worldmapper.org/

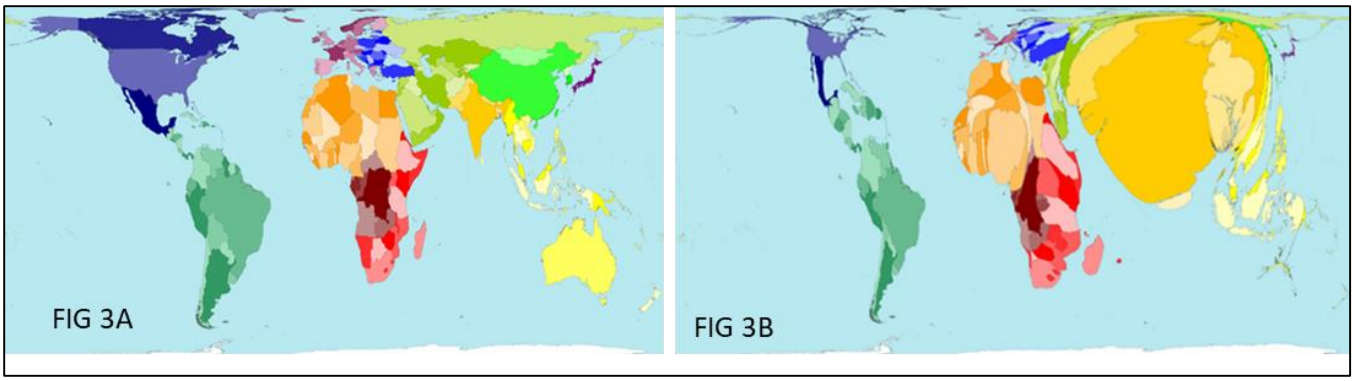


Figure 3. Global Prevalence of Teenage Pregnancy. FIG 3A depicts prevalence per country and FIG 3B shows a cartogram of countries resized according to the number of adolescences[3]

A more worrisome map is that of working physicians (Figure 4)[3]. Sub-Saharan Africa has very few physicians who are mostly concentrated in South Africa. This is as a result of training that exist within the country as well as an indication of how many are retained and employed in that particular country.

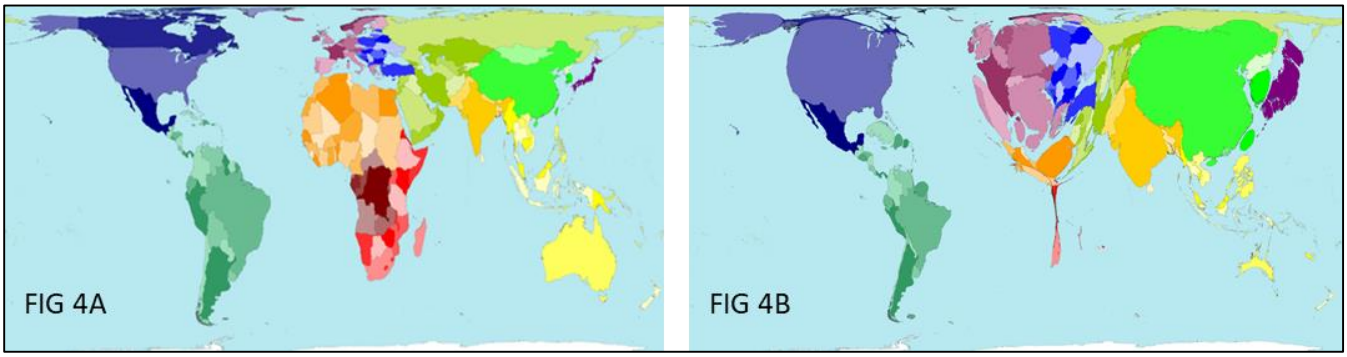


Figure 4. Working physicians. FIG 4A depicts prevalence per country and FIG 4B shows a cartogram of countries resized according to the number of working physicians[3]

Another metric to look at is illiteracy rates (Figure 5)[3]; while illiteracy rates may not necessarily be a direct indication of STEM training, it does provide an indication of how limited the STEM pipeline is globally.

[3] http://worldmapper.org/

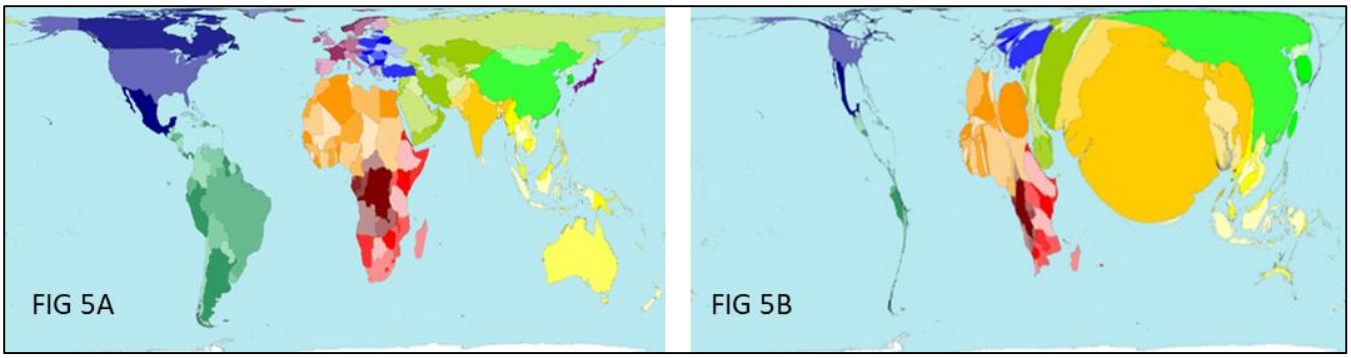


Figure 5. Illiteracy rates. FIG 5A depicts prevalence per country and FIG 5B shows a cartogram of countries resized according to illiteracy rates[4]

In terms of R&D expenditure (Figure 6)[4], the United States and Europe completely dominate the landscape with Africa barely hanging on by a thread.

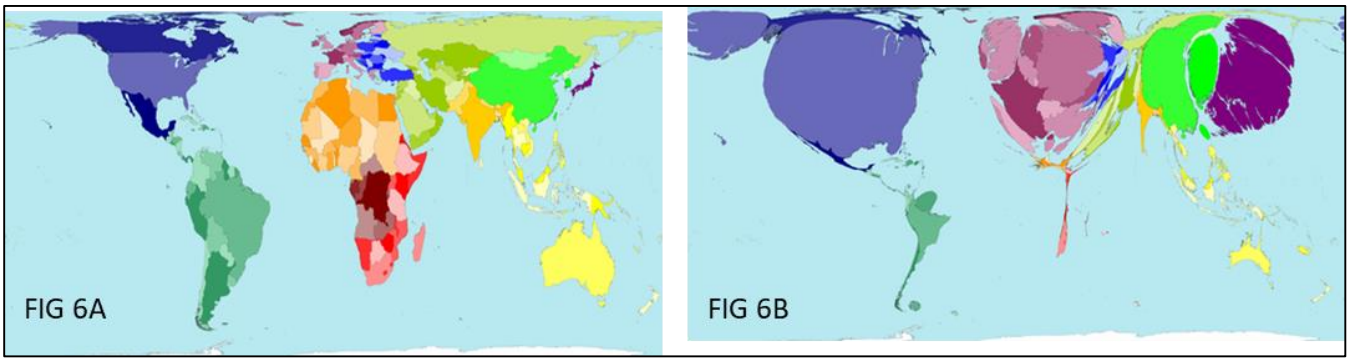


Figure 6. R&D expenditure. FIG 6A depicts prevalence per country and FIG 6B shows a cartogram of countries resized according to their R&D expenditure

In terms of science publishing (Figure 7)[4] and patents (Figure 8)[4], Africa barely exists on the map, a clear indication of how poorly Africa is doing in terms of science innovation.

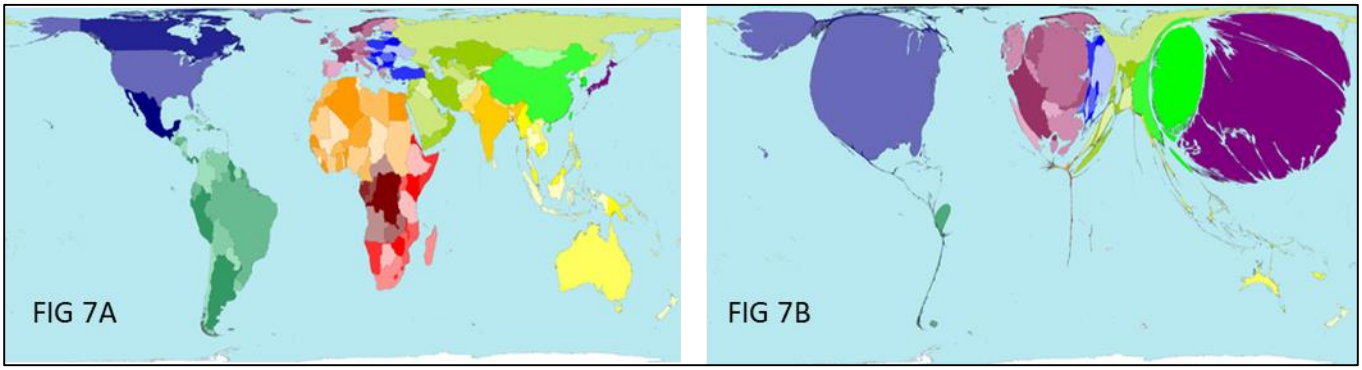


Figure 7. Science publishing. FIG 7A depicts prevalence per country and FIG 7B shows a cartogram of countries resized according to science publishing

[4] http://worldmapper.org/

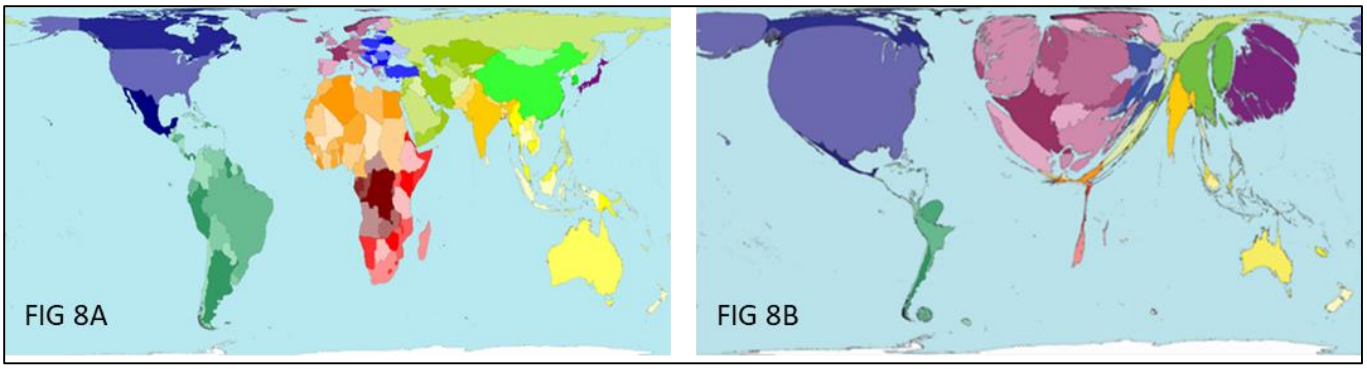


Figure 8.Patents. FIG 8A depicts prevalence per country and FIG 8B shows a cartogram of countries resized according to patents

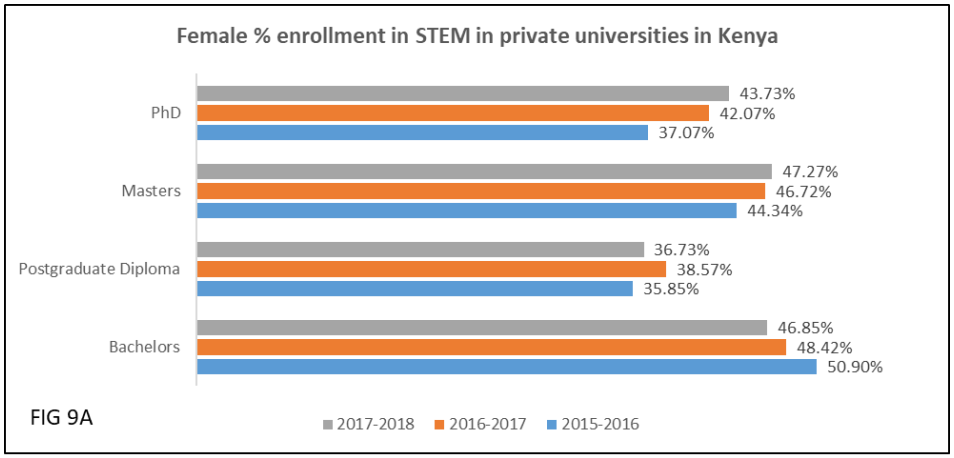
In summary, the world needs the contribution of African scientist. African scientists matter not only because African people matter but also because people everywhere in the world will thrive only if science is driven by the best possible talent and initiatives across the globe. Representation in STEM by African researchers however ought to be interrogated in other lens such as gender distribution.

Preliminary Gender Analysis of Secondary Data

Dr. Gitau pointed out that one of the main objectives of the project was to identify the enablers of supervision and mentorship that will allow for women to engage in higher numbers in the STEM training and their subsequent careers. However, there is need to conduct a gender analysis to establish country specific status of enrollment of women and girls into STEM courses at public and private universities in East Africa. This is because there are few women scientists in Africa, constituting a paltry 30.4% of scientists in Sub-Saharan Africa. Globally, the situation is no different. Few women complete science studies, and even less are recruited into STEM careers and few of them are retained to progress to 'successful' careers.

To demonstrate the status of enrollment of women in STEM courses in public and private universities, Dr. Gitau presented preliminary gender analysis of secondary data available from the Commission for

University Education (CUE) in Kenya. Overall, there is a decline in enrollment to STEM courses at Bachelor's degree for the period 2016 to 2018 in private universities, with a slight increase of the same statistic in public universities. At PhD level, there has been an increase in enrollment for both private and public universities; however, there is a huge decrease in the number of women who transit from Bachelors to PhD and it would be good to interrogate if these trends are similar for men.



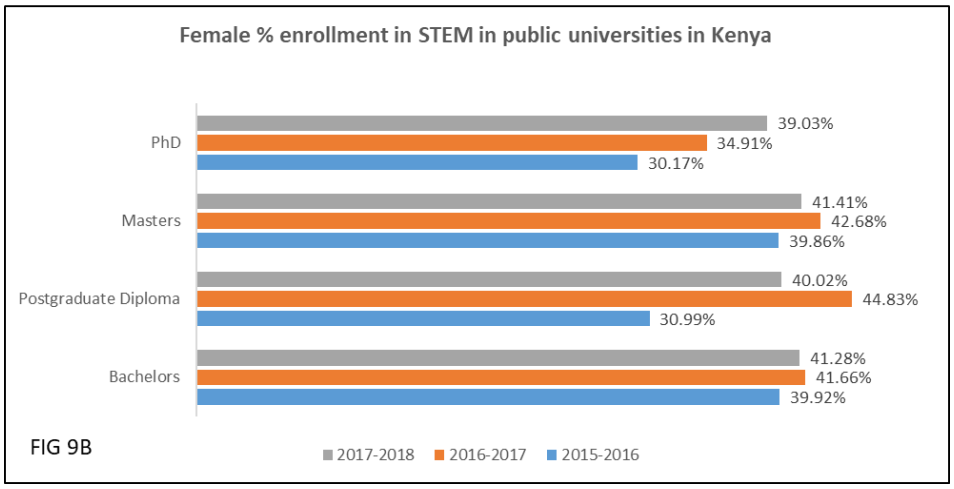


Figure 9. Gender distribution of enrolled students. FIG 9A Status of enrollment of women in STEM in Kenyan Private Universities FIG 9B Status of enrollment of women in STEM in Kenyan Public Universities

Current experiences of women in STEM in East Africa

The participants were divided into three groups to share their views on the participation and quality of experiences of women in STEM postgraduate training programs and careers in East Africa. In light of the

discussion the stakeholders highlighted that a significant ***gender imbalance*** remains at institutions of higher education despite a number of initiatives to increase enrollment of women in STEM.

It emerged that institutions of higher learning need to allow feedback from students on who supervises them as a way to encourage more ***female supervisors***. It was also noted that very ***few private Universities*** offer science related courses, as a result there are lower rates of female students for example in courses such as physics, mathematics and chemistry. Uganda Martyrs University indicated that they would need to have an ***incentive to recruit*** more females at a very basic cost but at the moment cannot provide for women's other family responsibilities, thus making it difficult for female candidates to enroll. This sentiment was shared by other institutions of Higher Education present. The team found a need to therefore have a deliberate incentive system to attract and retain female students using the example of the Consortium for Advanced Research Training (CARTA) model where childcare is paid for when one travels and where age cut offs are different to allow for women to enroll at a slightly older age than men.

University of Rwanda indicated that their Masters and PhD programs were supported by the World Bank and African bank ***centers of excellence*** and require that 30% of all students registered must be female. However, one challenge faced by the institution is that the ***majority of women do not meet the admission criteria at recruitment level for STEM courses***. This therefore necessitates the need for an additional strategy to upskill more female students in STEM before joining university.

Mentorship is a catalyst capable of unleashing one's capacity for STEM exploration, interest, and engagement and then enhancing the training environment in which the potential for STEM is fostered. Participants felt that supervisors should go beyond supervision to ensure they offer mentorship to female students interested in STEM courses.

There is also a need to ***build the capacity of mentors***, just like in supervision. This is especially true because mentorship skills and attitudes are not a natural occurrence but are acquired over a lifetime

and in varied circumstances. Therefore, there is a need to encourage staff to encourage students to look outwards for mentors, and not necessarily double up as supervisors and mentors.

Like most institutions, Uganda National Council for Science and Technology indicated that they have a ***low percentage of women in STEM*** hence the need to think around financial mechanisms that can be used to support women in postgraduate studies.

The team also highlighted ***Institution politics*** as playing a major role especially where ***politics is involved in the career progression***, women tend to shy away from such opportunity especially if the field is male dominated.

Two questions emerged from the discussion, which are worth considering in the new dispensation. First, what is the extent of gender balance in STEM postgraduate studies and leadership positions in institutions of higher learning in East Africa? Secondly, has there been fairness in allocation leadership positions in our institutions, and on what basis should the fairness be judged?

In summary, the brainstorming session and discussions pointed to a collective need for the East African region to examine the status of enrollment of women in STEM training, and their subsequent careers in public and private institutions. Whilst the region strives to catch up with the rest of the world in science production, it must strive to attain a gender balance that corrects past gaps and set the region to a more balanced science and development oriented society.

Validation of research questions

The goal of the second break out discussions session was to have the stakeholders validate the research questions. Dr. Anne Khisa led discussions to validate the study research questions with an aim to include any emerging areas of study. Thereafter, participants broke into three discussion groups, each focusing on one research objective. After group discussions, all groups presented a summary of their respective discussions. Notably, the suggested amendments fit into the general line of inquiry of the study, and won't necessitate an amendment in the approved research protocol. However, these nuances are now considered in new light, and related emphasis made in the different sections of data collection instruments, especially the in-depth interviews. The stakeholder's views against each research objective and questions are summarized on Table 1 with corresponding suggested amendments.

Table 1: Validation of Research Questions

Objective	Question(s)	Suggested amendment
To determine levels of gender equality in STEM-related post-graduate training and careers in East Africa?	1. Are there differences in gender distribution of students enrolled in STEM-related postgraduate courses at Masters and PhD levels? 2. Are there differences in gender distribution of students graduating from STEM related postgraduate courses at Masters and PhD levels? 3. Are there differences in gender distribution of faculty in the various STEM-related post-graduate disciplines at various academic levels over the last 10 years? (level of faculty) 4. Which practices promote or hinder gender equality in STEM related postgraduate training and careers in East Africa?	• While looking at the differences in gender distribution of students graduating from STEM related postgraduate courses at Masters and PhD levels, it should also include time to graduation. • There is a need to critically review the distribution of faculty members right from the junior staff all the way to the senior staff
To explore the factors that contribute to participation of women in STEM related postgraduate training and careers in East Africa.	1. What challenges and barriers to leadership do women face in postgraduate STEM related training and careers? 2. What policies and guidelines influence women's participation in STEM post-graduate training in East Africa? 3. Which existing supervision and mentorship systems and structures promote quality postgraduate training and career paths among women in STEM related areas in East Africa? 4. Are there enough potential female supervisors and mentors who can act as role models?	• Are there available and adequately skilled supervisors for women; Women striking the balance between work and life responsibilities. • What enhances participation of women in STEM? • Are there enough candidates at STEM postgraduate level? • What are the available funding mechanisms to support women in STEM post graduate training? • Are there available the right supervisors for women; • What strategies and incentives available for women? • Which financial mechanism that can be used to support women in Postgraduate studies?

Objective	Question(s)	Suggested amendment
To develop a comprehensive framework for optimal engagement of women in STEM related post-graduate training and careers in East Africa	1. What strategies and approaches provide for optimal engagement of women in STEM related post-graduate training and careers in East Africa? 2. What key performance indicators can be tracked to ensure women's success in STEM related careers?	• Specific team to follow up implementation; Integration within existing systems, to ensure sustainability; Providing information to the female postgraduate students: possible from offices with high student engagement; Provision of mentors; Role of alumni in mentorship of junior students; Collaboration between universities; sharing of best practices; job market analysis to bring out what employers need and can offer. • Indicators - Input / output rates: The group agreed this question is very broad and may need more specific questions to bring out all the necessary information, e.g. which mentorship styles/ approaches favor retention of women in STEM; who should be responsible for the implementation of those strategies and tracking of indicators to make them more effective. • It will also be important to widen the sources that will inform the framework, including prospective employers (appropriate data collection tool?)

Next Steps

We plan to hold another series of stakeholder engagement workshops in 2021. The sessions will help to obtain and include the views of more universities as well as relevant ministries, regulatory bodies and science granting councils in East Africa. It is envisioned that the next stakeholder workshop will take place in May 2021.

As part of implementation the study team will conduct a scoping review on supervision and mentorship of women in STEM. The scoping review will include a search of published literature as per the scoping review protocol, as well as grey literature. In this regard, the study team will contact universities and other relevant stakeholders to provide policies and any other relevant documents that govern postgraduate students in STEM training. This includes any COVID19 related guidelines for postgraduate students and researchers.

The study team will also contact universities and relevant stakeholders in STEM requesting for secondary data i.e. gender disaggregated data of students enrolled and graduated in STEM, as well as employment of faculty teaching STEM subjects. Finally, the study team will conduct faculty and researchers in IUCEA member universities and regional research institutions to participate in an online questionnaire and in-depth interviews.