CHAPTER 7

Gender-Lensed Supervision and Mentorship Framework for STEM Postgraduate Training in East Africa: Processes, Experiences and Lessons Learned

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Introduction

The sub-Saharan Africa (SSA) region continues to lag behind other regions in its efforts to meet global development goals. Of great concern is the low percentage of research outputs (1%) coming from SSA (World Bank Group, 2014) and the small number of research scientists (1.1%) (Okeke et al., 2017) from the region compared to other parts of the world, despite the region accounting for approximately 15% of the global population (Marincola & Kariuki, 2020). Furthermore, the percentage of women research scientists in the region remains low, at 30% (Huyer, 2015) and of these women, few hold leadership positions. In fact, women academics in Science, Technology, Engineering and Mathematics (STEM) account for only 31% of all leadership positions (Kimani-Murage, 2022) in SSA, and only 2.5% of universities in the SSA region are led by female vice-chancellors (Lirri, 2019). These statistics elicit concern and highlight the need to investigate whether the voices and perspectives of women are adequately being captured at decision-making tables in SSA.

To ensure gender equality in representation, particularly in leadership roles, and to promote effective and inclusive participation in socio-economic development, decision-making and policy direction in SSA, strengthening the capacity of African researchers and development practitioners, including women, is critical (Mpoke-Bigg, 2019; Poltera, 2019). The underrepresentation of women in these spaces limits the diversity of perspectives that inform research and policymaking in Africa, often resulting in development agendas that do not fully reflect the needs and experiences of all populations. Understanding the structural, cultural and institutional factors that contribute to this underrepresentation is therefore essential, as is examining how women's voices are captured and interpreted in research and decision-making processes. By increasing both the quantity and quality of women's participation, particularly through targeted support for their academic and professional development, countries can benefit from more inclusive, contextually relevant and sustainable solutions. Investment in high-quality and equitable postgraduate training is one way to build capacity, as it equips women with the skills, credentials and networks needed to contribute meaningfully to research and leadership. In particular, supporting women's participation in STEM postgraduate programmes is vital, given the growing importance of STEM in addressing development challenges. Such investments not only help close gender gaps in critical sectors but also strengthen the overall research ecosystem, enabling SSA to make progress towards achieving the Sustainable Development Goals (SDGs) (De Jongh et al., 2023; Dugbazah et al., 2022; Igumbor et al., 2020; Maier, 2007; McCowan, 2016).

Initiatives on women in STEM postgraduate training in SSA: The APHRC's efforts

The African Population and Health Research Center (APHRC)[1] is a premier research-to-policy institution that generates evidence, strengthens research and related capacity in the African research and development (R&D) ecosystem, and engages policy to inform action on health and development. The Center seeks to drive change by developing strong African research leadership and promoting evidence-informed decision-making across SSA. Consequently, APHRC engages with policymakers to influence policy decisions and tackle development challenges in SSA. Its profile has significantly grown over the past 20 years, and its reputation has become synonymous with research rigour,

1 https://aphrc.org/

leadership, influence and capacity strengthening of individuals, institutions and the research and development (R&D) ecosystems in SSA.

APHRC has led and implemented several initiatives that seek to strengthen the capacity of postgraduate training for women in STEM in SSA. The Consortium for Advanced Research Training in Africa (CARTA),[2] one of APHRC's flagship programmes, includes a gender position that addresses gender-related barriers for early-career researchers pursuing doctoral degree training. The CARTA Gender Position[3] highlights the importance of gender equality for development, taking cognisance of the distinct differences in the exposure and experiences of men and women within the African context. Tracking of CARTA sex-disaggregated data illustrated that within the programme, women made up 56% of its 245 early-career researchers as of 2024. APHRC is well positioned to provide insight on gender perspectives that relate to postgraduate training, research and leadership in SSA.

In 2020, APHRC, in collaboration with the Inter-University Council of East Africa (IUCEA),[4] embarked on a study to examine the participation and experiences of women in postgraduate training in STEM programmes in universities in East Africa. The two institutions have previously led joint initiatives with universities in the region that resulted in the development of *Standards and guidelines for postgraduate studies in East Africa* (IUCEA, 2018) with the aim of standardising and improving the quality of doctoral supervision across the East African region. A review of these standards revealed the lack of a gender lens and inadequate focus on supervision and mentorship in the document. This necessitated the establishment of gender-related parameters that would further strengthen postgraduate training in East Africa. Consequently, a three-year study was conducted to examine the participation and experiences of women in postgraduate training in STEM programmes in universities in East Africa. The study also emphasised supervision and mentorship parameters that contributed to women's participation in STEM postgraduate training with the aim of developing related strategies and a framework that would optimise their experience within the region.

Highlights of the study

In the collaborative study between APHRC and IUCEA, we employed a descriptive approach to examine the participation and experiences of women in

2 https://cartafrica.org/

3 https://cartafrica.org/carta-gender-position/

4 https://www.iucea.org/

postgraduate training in STEM programmes in universities in East Africa. Participants were drawn from five East African countries – Burundi, Kenya, Rwanda, Tanzania and Uganda. Data were drawn from:

- An online survey administered to 711 respondents, including students, faculty members and research leaders across the five East African countries;
- Five targeted in-person focus group discussions, each with an average of 11 women discussants (senior lecturers and research leaders and postgraduate supervisors, mentors and students) drawn from each of the five East African countries respectively;
- Semi-structured interviews with 66 participants, including senior researchers, research leaders and postgraduate students.

Our analysis, according to the *Supervision and mentorship of women in science, technology, engineering and mathematics' postgraduate programmes in sub-Saharan Africa: Final technical report of 2025* (APHRC, 2025), revealed the existence of significant gender disparities in the enrolment and graduation of women in STEM master's and doctoral degree programmes in favour of men across the various East African countries during the period 2011 to 2020. Although the number of women represented in postgraduate training increased yearly during this period, women accounted for a significantly smaller proportion of postgraduate students than men in both STEM enrolment and graduation phases. This shows that the underrepresentation of women in STEM postgraduate training, coupled with its effect on women's contributions to research, leadership and decision-making, continues to remain a concern in the African region (Christoplos et al., 2015).

Several individual, institutional and systemic factors were reported to have contributed to gender equality in STEM postgraduate programmes in East Africa. Of interest was the critical role that supervision and mentorship played in promoting quality postgraduate training for women in STEM in East Africa, taking cognisance of similar perspectives held globally (Igumbor et al., 2020; Lindahl et al., 2021; Okeke-Uzodike, 2021; Somefun & Adebayo, 2020; Wu et al., 2024). The report illustrated the need for greater intentionality in strengthening the capacity of supervision and mentorship to guide women towards quality postgraduate experiences in their postgraduate training and leadership and into the future.

According to the report, efforts had been made within the East African region to address gender diversity, equity and inclusivity in identified policy documents. However, the policies and related practices lacked a focus on

strengthening supervision and mentorship in universities in East Africa (see Chapter 3 for a broader discussion of gender policies in universities across Africa). Only 6% of postgraduate policy documents obtained from the various universities in East Africa mentioned the provision of technical support to complement the supervisory experience, while only 17% of them recognised the need for formal training of mentors and supervisors as best practice, thus demonstrating the dire need for greater emphasis on supervision and mentorship in both policy and practice.

Similar to other reports (Saleem & Mahmood, 2023), this report emphasised the critical role played by effective supervision and mentorship in enhancing women's experiences and participation in postgraduate training and their academic and professional development. However, supervision and mentorship continued to remain a challenge in postgraduate training.

According to the report, having a supervisor who was well aligned with one's research area and sensitive to socio-economic, cultural and gender challenges provided students with a highly supportive environment. Supervisors who were proactive and offered scientific guidance, emotional support and accommodation were also seen as particularly beneficial. For example, women appreciated supervisors who were understanding during pregnancy. Such empathetic support fostered strong relationships and was instrumental in enabling women to navigate challenges and succeed in their research work and postgraduate training, despite the challenges of motherhood. Additionally, effective policies and leadership were considered helpful in ensuring that the students were accountable and that they met set deadlines.

Despite the positive gains associated with effective supervision, some women reported negative experiences. Sexual harassment, a lack of alignment between the supervisee and the supervisor, and intermittent or delayed feedback and guidance were among the factors that most negatively affected women's experiences. Further, supervisors who failed to be sensitive to gender differences contributed to unsupportive and discriminatory academic environments, adversely affecting the supervision process, progress and well-being of women. Similar perspectives have been documented by previous researchers who have identified power dynamics and related gender and intersectionality aspects as barriers to effective supervision and research (Wisker & Fossland, 2023).

The report further highlighted several positive aspects of mentorship that significantly contributed to women's success. Strong interpersonal connections, supportive relationships, regular feedback, counselling and motivation were found to be great contributors to positive mentorship experiences for women.

Moreover, strong mentorship that focused on personal and professional development (including skills development) was critical to women's progress in postgraduate training.

Additionally, the report illustrated that effective mentors were those who fostered trust and collaboration, providing both professional guidance and personal encouragement. Constructive feedback and iterative improvements facilitated by mentors contributed to the mentee's academic proficiency and publication quality. Moreover, the benefits of effective mentorship extend beyond academic success. Mentors who motivated and guided their mentees significantly influenced their career trajectories, helping them progress from junior to senior academic positions. This continued support and inspiration highlighted the long-term impact of mentorship. These views aligned with those in other studies that highlight the role of mentorship in strengthening mentees' academic performance, intrapersonal and interpersonal skills, and professionalism (Deb et al., 2022). In general, mentors who actively promoted STEM education, especially for women, and provided personalised encouragement played a crucial role in fostering diversity and inclusion in these postgraduate training programmes. Mentors who emphasised values such as responsibility, integrity, compassion and excellence were also found to significantly contribute to the mentee's professional and personal growth. Accordingly, mentors who engaged in activities such as monthly group meetings (especially for underrepresented groups), addressed specific issues (including gender disparities) and provided valuable resources for their support were most helpful. This form of mentorship supported career development and fostered a community of practice among early-career professionals. These observations are consistent with existing literature (Deb et al., 2022; Hill et al., 2022) that emphasises the benefits of mentorship in providing personal and emotional support, alongside networking opportunities.

There were also some negative mentorship experiences that were highlighted in the report. They included misalignment between the mentors' and mentees' expectations, lack of sufficient engagement, commitment and support and inadequate time investment from the mentors, all of which can lead to missed opportunities for professional growth among mentees. More comprehensive details of the study can be found in the report.

Towards developing the gender-lensed SMF

In this chapter, we seek to highlight the journey towards the development of the gender-lensed Supervision and Mentorship Framework (SMF) for STEM

postgraduate training in the East African region, with a specific focus on the processes, experiences and lessons learned. We also seek to highlight the co-created supervision and mentorship strategies and the related gender-lensed SMF for the strengthening of women's experiences in postgraduate training in the East African region. The key questions shaping this chapter leverage the study described above and are as follows:

1. What critical processes informed the development of the gender-lensed SMF for STEM postgraduate training in East Africa?
2. What gender-lensed supervision and mentorship strategies and frameworks are necessary in strengthening women's experiences in postgraduate training in East Africa?
3. What were the lessons learned from women's experiences in the development of the strategies and related gender-lensed SMF for STEM postgraduate training in East Africa?

By answering these three questions, we aim to educate various stakeholders, including practitioners, on:

- The process towards replication of similar projects within the African region;
- What to expect, improve or avoid while undertaking a similar project and formulating related strategies and frameworks within the region;
- The supervision and mentorship strategies and framework that, if adopted and adapted, have the potential to strengthen the experience of women in STEM postgraduate training in East Africa, and by extension, the entire African region.

Approaches towards documenting the gender-lensed SMF

This chapter is descriptive in nature, based on document analysis. It utilises information extracted between 2020 and 2024 from email correspondence, reports and presentations made in various fora to draw insights on the processes, experiences, lessons learned and highlights on the formulated strategies and framework.

The email correspondences were mainly those between APHRC and IUCEA, and those with the various key stakeholders. The targeted stakeholders included:

- Policy actors, institutional leaders, faculty members, researchers and postgraduate students drawn from universities associated with IUCEA;
- Research institutions in East Africa;
- Government ministries, departments and agencies responsible for postgraduate training and research in the respective East African countries;
- Women who were established researchers and leaders within the East African region.

Information was also gathered from reports that comprised stakeholder engagement reports and annual progress reports, and several presentations that were made at various forums, including:

- Stakeholder engagements;
- Gender in STEM Workshop, held on 4–10 June 2023 in Ghana;
- African Research University Alliance (ARUA) Biennial Conference side event held in 2023 in Nigeria;
- Interregional Dialogue on Education and Development in Latin America, the Caribbean and Africa side event held in 2024 in Ethiopia.

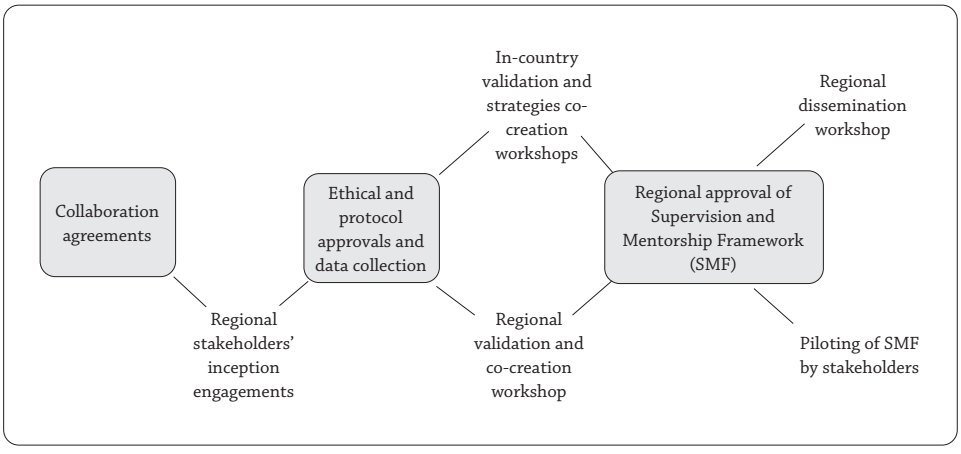
We utilised components of the 'who, what, when, where, why and how' approach (Hulme, 2014; Vetter, 2017) to comprehensively gather, describe and document the critical processes that were utilised in the development of the strategies and framework.

Critical processes in developing the gender-lensed SMF

We employed five critical processes in the development of the gender-lensed supervision and mentorship strategies and framework for optimal postgraduate training in East Africa. They comprised (1) collaboration agreement engagements; (2) country-specific study approvals and data collection; (3) stakeholder engagements; (4) the regional SMF approval process; and (5) piloting of approved SMF by stakeholders. The relationship between the various processes is illustrated in Figure 1.

We briefly discuss each of the processes below, using the 'who, what, when, where, why and how' approach.

Figure 1: Relationships between critical processes in the development of the SMF



Collaboration agreement engagements

Table 1: Description of the nature of the collaboration agreement engagements of the project

Who was involved	Why the process was carried out	How the process took place
APHRC and IUCEA	Need for joint development and ownership of the project, leveraging each other's strengths: • APHRC bringing in its expertise in project development and facilitation. • IUCEA, as a strategic partner, being the owner, convenor and implementor of the project in East Africa.	Leveraged existing Memorandum of Understanding to concretise the project plans.
IUCEA and associated universities, quality assurance agencies and ministry departments	IUCEA as the convenor of universities in East Africa: • To gain buy-in and commitment by the management of the universities, quality assurance agencies and ministry departments. • To gain access and permission to collect data from the respective universities.	Correspondent emails were sent to respective universities and quality assurance agencies and ministry departments: • Introducing the project, its purpose and APHRC as a facilitating partner. • Seeking consensus for data to be collected from institutions.
APHRC and in-country collaborators, includingresearch assistants	• To gain insight on the specific country landscape and nuances. • To ease in-country project activities and specifically facilitate protocol and ethical approvals, data collection and project facilitation.	• Identification of suitable and available collaborators, with assistance from IUCEA. • Execution of contractual agreements with clear terms of engagement.

At the onset of the project (between the years 2019 and 2021), APHRC engaged and executed collaboration agreements with various strategic partners within the East African region. The partners included IUCEA and its associated universities, relevant quality assurance agencies and ministry departments and in-country collaborators, including research assistants. The engagements took place through email correspondence and virtual meetings. Table 1 (above) further depicts the nature of the collaboration agreement engagements in terms of who was involved, the rationale behind the process and a brief outline of how the process unfolded.

Country-specific scientific and ethical approval

Country-specific scientific and ethical study protocols were developed through the collaborative efforts of the APHRC research teams, IUCEA and in-country collaborators. The related approvals were given by the relevant authorities in Burundi, Kenya, Rwanda, Uganda and Tanzania between 2021 and 2023. The purpose of this process was to ensure that the country-specific protocols were developed and taken through the rigour of internal scientific and ethical review at APHRC and external country-specific reviews, in line with the related provisions. This ensured sound scientific quality, alignment with national ethical considerations and compliance with the in-country ethical considerations of studies.

We collected data between 2021 and 2023, and only after country-specific ethical and protocol approvals had been obtained from the respective East African countries – Burundi, Kenya, Rwanda, Uganda and Tanzania. We collected secondary data based on the inclusion criterion of IUCEA member universities, excluding those that did not offer postgraduate programmes in STEM fields. For the online survey, our inclusion criterion was researchers affiliated with universities and research institutions within East Africa, while we excluded researchers from non-East-African countries. The criteria for collecting qualitative data mirrored those of the online survey. More specifically, we included researchers from East African universities and research institutions and excluded those working in non-STEM disciplines within East Africa. The target study participants comprised:

- Staff members and students enrolled in IUCEA member universities that offered postgraduate programmes in STEM;
- Postgraduate student supervisors and mentors (both male and female);

- Researchers based in regional African research organisations with a focus on STEM;
- Managers, administrators and coordinators of postgraduate training programmes;
- National commissions for higher education and research agency officials.

The purpose of the study was to examine the participation and experiences of women in STEM postgraduate training programmes and careers in East African countries, and to specifically provide evidence on the status of gender equality in STEM-related postgraduate training and careers in East Africa; and the factors that contribute to participation of women in STEM-related postgraduate training and careers in East Africa.

The study was descriptive in nature and utilised a mixed-methods design that included document analysis, scoping review, and qualitative and quantitative analyses based on information received from online surveys, key informant interviews (KIIs) and focus group discussions (FGDs)

Stakeholder engagements

We engaged in-country and regional stakeholders throughout the project, particularly between 2021 and 2024. The purpose of stakeholder engagements was to create awareness of the project, seek greater buy-in and commitment to the project and co-create various strategies for the project (see Chapter 11 for an alternative stakeholder engagement approach). More specifically, we held a total of nine stakeholder engagements that comprised: two regional inception meetings; five in-country validation workshops; one regional co-creation workshop in 2024; and one regional dissemination workshop in 2024.

Regional inception meetings

We held two virtual regional inception meetings in 2021 – one in February and the other in June. A total of 62 (68% women) key stakeholders drawn from East Africa participated in the meetings. They included vice-chancellors, deputy vice-chancellors, registrars, directors and deans of research and postgraduate studies, research scientists, doctoral and post-doctoral students, quality assurance directors, senior researchers, staff and faculty members (all drawn from universities associated with IUCEA) and relevant government ministry and agency officials. The aim of the inception meetings was twofold – to create awareness on the project and its related implementation plan; and to brainstorm

and co-create the project study questions on the participation and quality of experiences of women in STEM postgraduate training programmes and careers in East Africa. The agenda of the regional inception virtual meetings included:

- An overview of the project;
- Discussions, in breakout sessions, on the participation and quality of women's experiences in STEM postgraduate training programmes and careers in East Africa;
- Brainstorming and validation of the objectives and research questions – in breakout sessions;
- Presentation of the implementation plan and way forward for the project.

In-country validation workshops

It is worth noting that the results of the study were validated through in-country stakeholder workshops within each of the five countries and a regional co-creation workshop in East Africa. These processes ensured ownership by the various stakeholders to foster further deliberations and capture additional insights for supervision and mentorship of women in STEM postgraduate training in East Africa. Upon completion of the project study on examining the participation and experiences of women in postgraduate training in STEM programmes in universities in East Africa, we held face-to-face validation workshops in each of the five countries (see Table 2).

Table 2: Description of validation workshop participants per country

Country	Participants
Rwanda	33 (68% women) key stakeholders including faculty members, registrars, researchers, postgraduate students, ministry officials and representatives from APHRC and IUCEA
Burundi	33 (61% women) key stakeholders including the Permanent Executive Secretary of the National Commission of Science, Technology and Innovation, faculty from various universities, researchers and representatives from APHRC and IUCEA
Uganda	31 (52% women) key stakeholders including officials from the Ministry of Education and Ministry of Agriculture and Innovation, faculty members from various universities and representatives from APHRC and IUCEA
Tanzania	34 (59% women) key stakeholders including a representative of the Commission for Science and Technology, university members and representatives from APHRC and IUCEA
Kenya	37 (65% women) key stakeholders including faculty members from universities in Kenya, researchers, postgraduate students, ministry officials and representatives from APHRC and IUCEA

The aim of the workshops was to validate the data collected from the respective countries, increase their ownership, and jointly brainstorm and co-design

supervision and mentorship strategies applicable to each country, based on the study results. The validation workshops entailed: the presentation of preliminary in-country findings from the study; discussions on the key study findings and formulation of relevant recommendations; and discussions on possible strategies towards optimising supervision and mentorship within East Africa.

Regional co-creation engagement

We convened a regional collaborative co-creation workshop in Kenya in August 2024 to co-create a comprehensive framework for gender-responsive supervision and mentorship in STEM postgraduate training for East Africa, based on the findings of the project study and recommendations from the in-country validation workshops. The workshop consisted of 60 (52% women) key stakeholders drawn from the East African region, including directors and vice-chancellors of institutions offering STEM postgraduate training programmes, government representatives in higher education and research, faculty leaders, STEM postgraduate students and representatives of research regulatory bodies across East Africa. Through the two-day co-creation workshop, we provided the basis for adoption of the SMF at the regional level, and specifically:

- Validated the supervision and mentorship strategies that were co-designed at the country levels;
- Co-created the regional gender-lensed SMF for optimum postgraduate training in East Africa;
- Sought greater buy-in, commitment and assurance to strengthen supervision and mentorship in the region.

We provided the participants with an overview of the project and presented them with the project milestones and results and feedback from the in-country validation meetings, including areas of commonality and divergence. The participants further co-created the SMF template, in randomly designated groups, and identified the key elements of the framework, feeding into each group's templates and enriching them. In addition, country teams discussed the co-created elements of the SMF, seeking to define country-specific actionable steps, including roadmaps and related roles and responsibilities.

Dissemination workshop

Following the approval of the SMF by the East African Community (EAC), through the IUCEA, we convened a virtual regional dissemination workshop

in November 2024. The virtual workshop comprised 150 key stakeholders from the East African region. They included directors and vice-chancellors of institutions offering STEM postgraduate training programmes, government representatives in higher education and research, faculty leaders, STEM postgraduate students and representatives from research regulatory bodies across East Africa. The purpose of the dissemination workshop was mainly to create awareness of the approved SMF, for greater buy-in and adaptation in postgraduate training in the East African region and at the regional, national and institutional levels. During the virtual workshop, we gave the participants an overview of the entire project, engaged them in the various components of the approved SMF and led them in discussions on the next steps towards its implementation, including its piloting.

Overall, the gains of the stakeholder engagements were threefold:

- Create awareness of the status and experiences of women in STEM postgraduate training in East Africa;
- Solicit buy-in and commitment to the process of promoting gender-lensed supervision and mentorship within the region;
- Co-create the gender-lensed strategies and framework for the promotion of supervision and mentorship in postgraduate training in East Africa, based on the obtained data.

Extensive consultations were carried out with the key stakeholders to determine the supervision- and mentorship-related strategies that would promote the participation of women in postgraduate training to co-create a comprehensive gender-lensed framework tailored to address the unique needs of STEM postgraduate students in this region. This collaborative approach ensured active engagement with the stakeholders, and that the framework was well-rounded, inclusive and aligned with the needs and perspectives of various stakeholders involved in higher education and research in the region (Rădulescu et al., 2023; Vargas et al., 2022). Moreover, the stakeholders considered themselves part and parcel of the process, thus facilitating greater buy-in, ownership and commitment towards the implementation of the framework, in addition to the sustainability of the initiative beyond the project's life (Avila-Garzon & Bacca-Acosta, 2024)

Approval of the regional gender-lensed SMF

Subsequent to the co-creation process, the SMF was refined by a team drawn from APHRC and IUCEA; reviewed and validated by participants in the regional co-creation workshop; officially submitted to the IUCEA management team by the APHRC team; presented by the IUCEA management for approval; and reviewed and approved by the IUCEA Committees in charge of higher education and the EAC in meetings held in Uganda in August 2024. This process was necessary to increase the regional rating and credibility of the SMF as a tool to enhance optimal postgraduate training in East Africa, thus validating its incorporation into the *Standards and guidelines for postgraduate studies in East Africa* (IUCEA, 2018). The approved gender-lensed SMF for postgraduate training in East Africa (IUCEA, 2024) was disseminated to the various stakeholders and uploaded onto the IUCEA website. The final process, which was ongoing at the time of this write-up, was the piloting of the SMF, before its full implementation in the East African region.

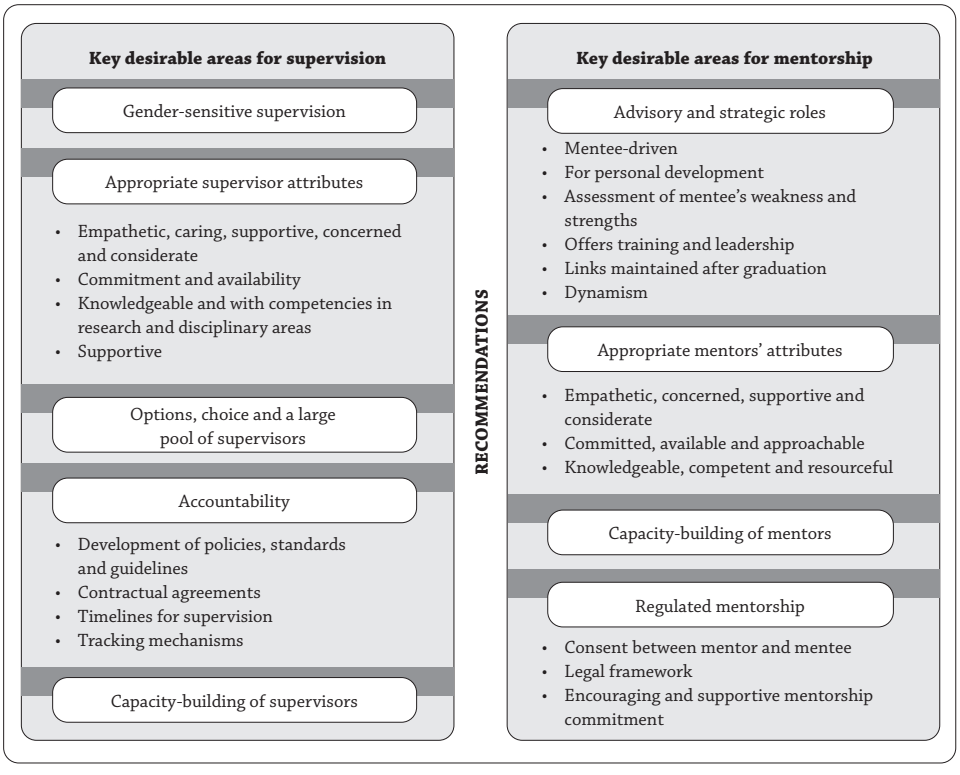
Gender-lensed supervision and mentorship strategies and framework

Effective supervision and mentorship are crucial components of STEM postgraduate training (Gangrade et al., 2024; Lindahl et al., 2021; Wu et al., 2024). In East Africa, where the demand for high-quality education and research continues to grow, understanding and implementing desirable supervision and mentorship strategies were considered essential to enhance women's performance in postgraduate training and their future trajectories as researchers and leaders in the region.

Key stakeholders, during the country-specific validation and co-creation workshops, recommended the integration of mentorship with supervision into existing policies, standards and guidelines at the postgraduate level, resulting in the formulation of gender-lensed strategies. They also recommended the establishment of supportive structures and the breaking of gender stereotypes to create a more inclusive and supportive environment for the supervision and mentorship of women in STEM postgraduate training in East Africa. Figure 2 highlights the areas that were identified by stakeholders as critical to both supervision and mentorship in postgraduate training in East Africa.

The stakeholders highlighted the need to ensure that the supervisors and mentors have appropriate attributes for supervision and mentorship, respectively, and to have their respective capacities built, as shown in Figure 2.

Figure 2: Desirable strategies for supervision and mentorship in postgraduate training in East Africa



More specifically, the stakeholders considered the following supervision- and mentorship-related strategies as essential in optimising women's participation in STEM postgraduate training in East Africa.

Effective supervision strategies

Supervisors need to be aware of gender differences, issues and inequalities, and to consider them during supervision, recognising how gender roles and responsibilities affect individual students and their academic trajectories, as well as how to address these parities appropriately.

Effective supervision relies on supervisor attributes. These attributes included commitment, availability, empathy, knowledge, competence in research and disciplinary areas, support, care, concern and consideration, as well as the ability to provide constructive feedback. Supervisors who demonstrated

a genuine interest in their students' development and created a supportive environment had the potential to significantly impact their academic and professional trajectories. In this respect, supervisors should strengthen their technical expertise and enhance their ability to understand and address the unique challenges faced by supervisees, particularly women.

Considering the *opinion of students* during the allocation of supervisors allows them to have supervisors whose styles of leadership and supervision align with their specific needs and preferences. The freedom to be part of the decision-making process for the selection of their supervisors empowers the supervisees and fosters a sense of autonomy in their educational journey. It also increases the likelihood of the supervisees finding appropriate supervisors who would offer personalised guidance and support, tailored to their individual circumstances.

Facilitation and formalisation of effective supervision relationships through clear *contractual agreements* are necessary. These agreements should be aligned with the expectations, responsibilities and commitments of both the supervisor and supervisee. Such formalised structures would ensure accountability and clarity, preventing misunderstanding and promoting a professional relationship. This facilitation should include the provision of resources and support systems that enable the supervisees to engage in meaningful interactions with their supervisors, including through regular meetings, workshops and access to professional development opportunities.

Accountability mechanisms, including peer reviews, feedback surveys and performance assessments, are vital to maintaining the integrity and effectiveness of the supervision process. Consequently, regular evaluation and feedback loops should be made available at the various institutional levels to ensure that supervisors and supervisees uphold high standards of conduct and respond to the needs of the latter.

Comprehensive *training programmes for supervisors* should be availed. Such training programmes would equip supervisors with the skills and knowledge required to support students effectively, including understanding gender dynamics, fostering inclusive environments and employing effective communication strategies. The training programmes would also ensure that supervisors are well-prepared to address the diverse needs of their supervisees.

Robust policies that lead to the institutionalisation of gender-sensitive supervision should be developed and implemented at various institutional levels to support postgraduate training in East Africa. These policies should address parameters that promote equal access to opportunities, anti-harassment measures and work–life balance, among other aspects. *Tracking mechanisms*, such as

progress monitoring and data collection on supervision outcomes, should also be instituted to evaluate the effectiveness of these policies. These mechanisms would provide insight into the impact of supervision and highlight areas for improvement, ensuring continuous enhancement of practices.

Timeliness in supervision is a critical factor in effective supervision. Supervisors should be available and responsive, providing timely feedback and support to their supervisees. This responsiveness would enable students to stay on track with their academic and professional goals, addressing challenges as they arise and maintaining momentum in their development. Institutions needed to emphasise the importance of timely supervision and provide structures that facilitate regular and consistent supervisor–supervisee interactions.

Effective mentorship strategies

With respect to mentorship, the stakeholders considered the mentor's role as a *strategic advisory* one that needed to be *mentee-driven* and that would enhance the mentee's personal development. According to Figure 2, mentors needed to exhibit the following *attributes* that were considered appropriate for an effective mentorship process – *empathetic, supportive, considerate, committed, available, approachable, knowledgeable, competent and resourceful*.

Several other effective mentorship strategies were identified, including the *provision of a supportive and gender-sensitive mentorship environment; mentors making practical adjustments to accommodate personal responsibilities; and encouragement of women to mentor other women*, while recognising that effective mentorship can be influenced by either gender. Other effective mentorship strategies included *advisory and strategic support from mentors* and *aligning guidance with the mentee's goals and needs*. Consequently, the mentors needed to have *relevant experience and a willingness to adapt their approach to the mentee's evolving requirements*.

The stakeholders emphasised the *value of mentors who guide their mentees towards leadership roles and provide access to resources*. This support involved not only aiding academic progress but also facilitating networking opportunities and leadership development. *Maintaining a strong, approachable relationship* also emerged as an essential strategy in mentorship (Hill et al., 2022). Ensuring *mentorship extended beyond academic training* to include long-term career guidance and support was also crucial for the sustained success of the mentee. Another strategy that was recommended was the *regulation of mentorship in postgraduate training* in East Africa, as depicted in Figure 2. This would entail

the provision of a legal mentorship framework that would enhance the commitment of both the mentor and the mentee to the mentorship process.

Co-creation of the gender-lensed SMF

Based on the identified strategies, the stakeholders co-created a framework for the optimal implementation of the gender-lensed supervision and mentorship strategies for strengthening women's participation in STEM postgraduate training in East Africa. The stakeholders underscored the importance of four key components to ensure the effectiveness and inclusivity of the gender-lensed SMF for postgraduate training in East Africa, which is accessible on the IUCEA website. The four key components of the framework are summarised below and include (1) execution and management; (2) stakeholder engagement; (3) capacity strengthening initiatives and governance control; and (4) assurance and enhancement. All of which were applied to the institutional, national and regional levels to ensure comprehensive and tailored implementation across different contexts. Together, these efforts would create a supportive and equitable framework for gender-lensed supervision and mentorship in STEM postgraduate training in East Africa.

Execution and management

Comprehensive planning, which includes setting strategic goals, conducting needs assessments and integrating gender equity into institutional policies, is necessary in the execution and management of the supervision and mentorship framework. Moreover, the planning process needs to be aligned with institutional, national and regional strategic objectives. There is a need for adequate resourcing, which includes equitable allocation of funding, equipment and opportunities, alongside recruitment and strengthening the capacity of staff members who are committed to gender-sensitive practices. This would maintain operational effectiveness in the execution and management of the gender-lensed framework.

Developing and maintaining efficient systems and organisational structures, alongside cultivating a culture of excellence and instilling core values, is necessary to reinforce positive behaviours and ethical standards. An appropriate culture and values that foster inclusive academic environments, diversity and gender equity need to be cultivated at institutional, national and regional levels. In addition, leaders need to model these values for the greater effective execution of the framework. It is also necessary that the various levels

of institutions implement robust motivation and performance management systems to drive excellence and achieve high levels of staff engagement and productivity while executing the gender-lensed supervision and mentorship framework. This includes setting achievable goals, recognising achievements and providing incentives for engagement.

Stakeholder engagement

There is a need for thorough stakeholder mapping and engagement to identify and involve key players, ensuring diverse perspectives are included in supervision and mentorship decision-making processes. Effective communication is needed to build trust and facilitate collaboration. Moreover, participation from a broad range of stakeholders is crucial for robust outcomes to be achieved in supervision and mentorship in STEM postgraduate training in East Africa.

Capacity strengthening initiatives

Capacity strengthening for effective supervision and mentorship is crucial to maintaining high standards and encouraging innovation (Igumbor et al., 2020). Moreover, institutions need to enhance the mentorship and supervision capacities of their staff members and researchers by offering regular training opportunities. Equally important are peer learning initiatives that foster knowledge-sharing and collaborative growth, allowing individuals to learn from one another's experiences and expertise. These efforts not only enhance individual competencies but also facilitate the building of a more cohesive and capable institutional workforce, while promoting gender equity and cultivating quality research. Training and peer learning also prepare the institutions to address complex challenges and achieve their strategic goals for supervision and mentorship.

Governance control, assurance and enhancement

There is a need for effective governance controls at the institutional, national and regional levels to maintain high standards in research and institutional operations with respect to gender-lensed supervision and mentorship. Comprehensive gender-lensed policies that provide clear guidelines and expectations for effective and inclusive supervision and mentorship need to be developed, and aligned with regional, national and institutional visions, missions, goals and regulatory requirements. Continuous monitoring and

evaluation need to be prioritised, tracking progress, ensuring compliance and identifying areas for improvement in the gender-lensed SMF. Moreover, mechanisms need to be instituted to effectively monitor and evaluate performance using clear and fair criteria and provide regular feedback to the various stakeholders on gender-related disparities. Robust gender-lensed supervision and mentorship risk assessment and management strategies also need to be employed at the various institutional levels to identify potential threats and develop proactive measures to mitigate them, safeguarding diversity, equity and inclusivity parameters, institutional interests and operational continuity.

Lessons learned

The development of the gender-lensed SMF (IUCEA, 2024) for STEM postgraduate training in East Africa was a success and culminated in its regional adoption. We highlight the lessons learned in its development in this section.

Despite having the backing of IUCEA, we still experienced university and national-level bureaucratic hurdles during the data collection, specifically in obtaining relevant approvals at the two levels. This affected our survey distribution and delayed the collection of data in specific universities and countries. We therefore underscore the importance of proactive planning, robust communication channels and building strong local partnerships to mitigate delays during the data collection phases of such multi-country and multi-institutional projects. By anticipating such potential challenges and establishing clear communication pathways, project teams can align themselves accordingly and prepare to promptly address related concerns. This approach not only enhances efficiency but also reduces the risk of setbacks that could impede progress.

Project teams should be agile, flexible and adaptable to methodological changes that are geared towards addressing unexpected obstacles during the phases. The ability to adjust plans and methodologies in response to unforeseen challenges allows project teams to navigate challenges effectively and maintain the integrity of their work. Project teams should therefore be adaptable to approaches that seek to accommodate varying national regulatory frameworks and operational constraints across different countries, enhance proactive planning for contingencies and embrace robust communication channels when necessary. By embracing flexibility, teams can mitigate delays in project development and implementation, uphold ethical standards and optimise effective resource utilisation.

Leveraging our existing regional partnership with IUCEA and in-country collaborations facilitated connections with other institutions, enabling the

project to progress, amidst COVID-19 pandemic restrictions. The in-country collaborators also facilitated team set-up, data collection and research approvals, thereby enhancing the validity and applicability of research findings in diverse contexts. We recommend that future project teams foster collaborative relationships and leverage local expertise to enhance the validity and applicability of project outcomes from diverse contexts. Further, we recommend that project teams seek to establish and leverage strong local and strategic networks, equitable partnerships and collaboration with regional and national authorities and conveners, such as IUCEA, to facilitate access to member universities. These networks and partnerships would also provide support, local expertise and shared resources, knowledge and good practices, thereby facilitating more efficient and effective project processes and sustainability of initiatives (Horan, 2022). Enhanced collaboration also promotes the dissemination, validation and adoption of project results and supports the development of innovative solutions.

Our engagements with the in-country collaborators provided invaluable perspectives on the nuances of implementing multi-country studies amidst the backdrop of the pandemic, and on diverse research system dynamics and contextual factors influencing research practices and outcomes. Project teams should seek to establish strong partnerships with in-country entities that can provide invaluable support and expertise, and who can facilitate the successful implementation of multi-country projects. Local in-country expertise and support are particularly critical during challenging circumstances, as they provide essential advice, insights and coordination of all required resources. Based on our partnership and collaboration interactions at regional and country-specific levels, we further underscore the significance of a future comparative study to identify similarities, differences and best practices across different research environments.

The in-country validation and regional co-creation workshops provided critical inputs for developing a comprehensive gender-lensed framework for supervision and mentorship in postgraduate STEM programmes. This collaborative approach ensured that the results were grounded in the real-world experiences and needs of stakeholders, supporting the development of actionable strategies to enhance gender equality in STEM. The stakeholder engagements fostered a collaborative environment where expectations were clearly defined, and everyone was committed to the research objectives. This alignment was crucial for the smooth execution of project activities, follow-up and the successful dissemination of results. Project teams should employ strategies that promote clear communication and regular meetings with

relevant stakeholders to ensure buy-in, commitment and alignment in working methodologies.

The SMF for postgraduate training in East Africa has been adopted at the regional level and needs to be cascaded to national and institutional levels in the region. The process of piloting the framework at a small scale would further validate the SMF, giving way to its full-scale adaptation within the East African region. We present the framework and recommend that other African regions adopt and adapt it to strengthen supervision and mentorship, and ultimately, the participation of women in STEM postgraduate training in SSA. We further recommend that similar projects be carried out in other African regions to provide a more comprehensive picture of STEM postgraduate training in the region, leveraging approaches, experiences and lessons learned in the East African scenario. Moreover, we recommend that regional teams carrying out similar projects establish and nurture strong partnerships and collaborations with local stakeholders, including universities and the strategic regional government in charge of postgraduate training and research in their specific regions. Such collaborations not only enhance resilience but also leverage local expertise and resources to optimise project outcomes. By fostering such partnerships and collaborations, project teams can navigate bureaucratic hurdles more effectively and ensure the validity and applicability of interventions in diverse contexts.

Conclusion

Supervision and mentorship play a critical role in advancing the participation of women in STEM postgraduate training programmes in East Africa, and by extension, SSA. Women experience challenges that hamper their advancement in postgraduate training, research and consequently leadership in the region. Key stakeholders drawn from countries within the region identified gender-lensed strategies that were necessary to strengthen supervision and mentorship in STEM postgraduate training and research in East Africa. This led to the co-creation and approval of a gender-lensed SMF to strengthen support for STEM postgraduate training in East Africa.

The success in the development of the gender-lensed framework is greatly attributed to various processes that were put in place to mitigate against the advanced effects of the challenges and to optimise the outputs of the project. The processes employed included leveraging existing strategic partnerships with the IUCEA, which had regional convening powers for universities in East

Africa, identifying key country-specific collaborators, and regularly engaging with key regional and national stakeholders at all stages of the project.

The approved regional gender-lensed SMF for postgraduate training in East Africa will need to be implemented at the regional level and cascaded to the national and institutional levels, as well as evaluated at each level. That said, given the achievements of this project thus far, we suggest it is worth establishing similar frameworks to promote women in STEM postgraduate training, research and leadership in the other SSA regions. Relevant researchers and policy actors in postgraduate training should consider how to scale up the initiatives described in this chapter in the other SSA regions, leveraging the methodological gains, challenges and lessons learned.

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