Improving Gender Balance in STEM Higher Education in Tanzania

POLICY NOTE

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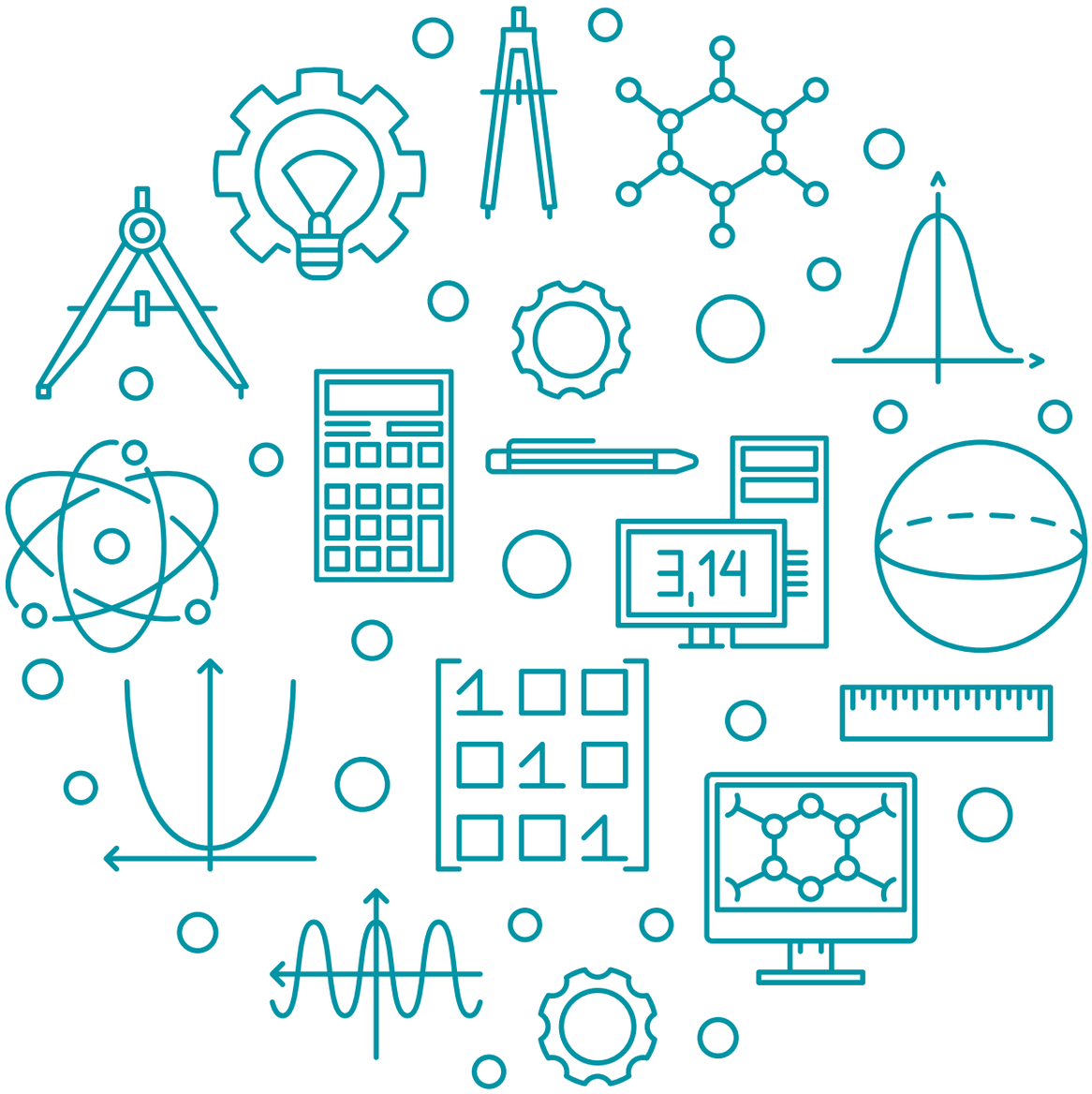
WORLD BANK GROUP



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Acknowledgments

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Acronyms

AAS	African Academy of Sciences
AAU	Association of African Universities
ADB	African Development Bank
AESPR	Annual Education Sector Performance Report
ASCEE	Advanced Certificate of Secondary Education Examination
CGIAR	Consultative Group on International Agricultural Research
CSEE	Certificate of Secondary Education Examination
IELS	International Early Learning Study
GP	General Practitioner
HESLB	Higher Education Student Loans Board
HIGHER	Higher Institute for Growth in Health Research
MoEST	Ministry of Education, Science and Technology
NGO	Non-Governmental Organization
NSIE	National Strategy for Inclusive Education
LGA	Local Government Authority
OECD	Organisation for Economic Cooperation and Development
SDG	Sustainable Development Goals
STEM	Science, Technology, Engineering and Mathematics
STEMM	Science, Technology, Engineering, Mathematics and Medical Science
SUZA	State University of Zanzibar
TCU	Tanzania Commission for Universities
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund
VCs	Vice Chancellors
SSA	Sub-Saharan Africa

Executive Summary

Introduction

With a female enrollment rate of 38.5 percent in 2018 in higher education, Tanzania is performing below the sub-Saharan Africa (SSA) average of 42.3 percent.[1] The situation of gender imbalance is more acute in Science, Technology, Engineering and Mathematics (STEM) programs, where female students account for only 33.6 percent of the total student population. This is happening in a context of widespread gender-based violence, which is an outstanding issue in many parts of Tanzanian society.

The lack of gender balance has important detrimental effects. Given the extensive social and private benefits that higher education generates, ensuring inclusive access and success is essential to achieve social justice and economic efficiency by encouraging the realization of the full potential of all young people. Against this background, the main objectives of the Policy Note are to address the following key questions: What are the main barriers preventing girls from participating on an equal basis in STEM higher education programs? What would be effective policies to offer greater access to, and improved learning outcomes for, girls in STEM programs in higher education?

Gender Imbalances in Tanzanian STEM Higher Education

The proportion of new female students admitted into the Tanzanian higher education system increased from 34.5 percent to 38.6 percent between 2012 and 2019, but the share among PhD students has remained low (26 percent).[2] Even more worrisome from an economic development perspective is the high level of gender imbalance in STEM programs. In 2018, the share of women as a percentage of total enrollment was the lowest in Engineering programs (18.5 percent), followed by Mining and Earth Sciences (20.2 percent) and Physics and Mathematics (26.1 percent).[3]

Understanding the determinants of gender disparities in STEM higher education programs in Tanzania requires a pathway analysis that looks at two critical stages that affect the pipeline of females: (i) from early childhood to the end of high school; and (ii) access and success in higher education. There is a direct link between the outcomes for young women in lower levels of education and their outcomes in higher education. The challenge starts with the transition from primary to lower secondary education. While more girls than boys reach the end of primary school, a smaller proportion continue on to secondary school. Once enrolled in lower secondary, girls experience high drop-out rates, peaking after examinations at the end of Form 2.[4] There is also a sharp drop in the number of students, particularly girls, who transition from lower to upper secondary. Overall, for every 1,000 girls that start lower secondary, only 158 complete upper secondary, compared to 216 boys.[5] While 48 percent of girls passed the Ordinary Level (O Level) examinations, only 38 percent passed the Advanced Level (A Level) examinations. Female students tend to have lower pass rates than males in scientific disciplines at both examination levels, with particularly poor results in the O Level examinations.[6]

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1 Authors' calculations based on Tanzania Commission of Universities (TCU) 2019, UNESCO Institute of Statistics database.

2 TCU 2020

3 TCU 2019

4 Form 2 is equivalent is Grade 8

5 MoEST BEST 2018

6 MoEST-AESPR 2020

In Tanzania, as elsewhere, stereotypes about which gender is more talented in mathematics and science and more able to work in STEM positions are a critical driver of the gap between girls and boys. These stereotypes determine the psychological factors, such as aspirations, identity, interests, mindsets, motivation, and self-confidence, that influence the students themselves, their peers, parents, and teachers. Stereotype threats negatively influence academic performance by inducing young women to worry that low performance could confirm the negative views about their ability to be successful in science subjects. Teachers are also prone to perpetuate these stereotypes either in a deliberate manner or without being aware of their own biases.

One reasons for the low performance and high dropout rates of Tanzanian young women at secondary is the fact that secondary schools do not offer a safe and supportive learning environment. The insufficient number of government-run (public) schools results in long distances to school and increased risks faced by girls in travelling to and from school. Lack of reliable and safe transport to and from school are key contributing factors to dropout and low female transition rates from primary to lower secondary school. Availability of electricity is another contributing factor. As of 2020, only 25.4 percent of rural areas have access to electricity.[7] This means that neither schools nor households are connected in many villages, seriously constraining learning opportunities for both boys and girls in rural areas. Adolescent pregnancies and early marriage also contribute to student drop-out.

Once female students are enrolled in higher education STEM programs, however, they tend to obtain better academic results than their male counterparts. In the absence of comparative data on grades for male and female students in university, dropout data offers a proxy, albeit an imperfect one, for academic performance. Girls form a smaller share of the students who drop out of STEM programs compared to boys suggesting that girls obtain the academic results necessary to continue in these programs. For example, only 9 percent and 12 percent of the total number of student dropouts in programs like Agriculture, and Physics and Mathematics, respectively, are female.[8] This suggests that the main problem faced by women is one of access rather than academic ability to succeed.

The lack of gender balance among students at the university level contributes to significantly lower proportion of female academics than males, which in turn implies fewer role models for young women. Fewer women can be found in academics of various professions. By 2018, the total share of female academics in agriculture, engineering, ICT, mining and earth sciences, physics and mathematics was 21 percent in Tanzania.[9] The equivalent share of female students in these programs was 26 percent. The smaller share of female academics in Tanzanian higher education institutions is not only the result of the lower share of female students in higher education but is equally due to greater difficulties in getting permanent positions, being promoted, accessing research funding, and being considered for leadership roles in a world where men occupy most power positions. Furthermore, sexual harassment and gender-based violence remain prevalent in the academic world across public and private universities.

7 https://energypedia.info/wiki/Tanzania_Energy_Situation. Some sources suggest a higher level of electrification – up to 78 percent public schools in lower secondary.
8 Tanzania Commission for Universities (TCU) 2019
9 Author calculations based on TCU 2019

Improving the Gender Balance in STEM Higher Education

Policy Framework

An essential factor to strengthen the quality of teaching, learning and research in Tanzanian universities is to improve the gender balance by significantly increasing the proportion of young women enrolled in STEM programs and PhD programs generally, among senior female academics, and among university leaders. Efforts to that effect are needed not only from an equal opportunity and social justice viewpoint, but because diversity among students, academics, and university leaders is known to produce better results in terms of academic excellence and decision-making capacity in universities.

International experience suggests that a comprehensive approach is needed to achieve a better gender balance in STEM programs. Countries obtaining the best results rely at the same time on national and institutional-level interventions that complement each other. Furthermore, these interventions combine both financial and non-monetary measures.

National Policies

The Government of Tanzania has adopted several relevant policies that provide the framework for the formulation of a specific higher education gender balance policy. The most important documents are the Women and Gender Development Policy issued in 2000 and the National Policy Guideline for the Health Sector Prevention of Gender-Based Violence. This was followed by the launch in 2017 of the National Plan to End Violence Against Women and Children. Finally, the Vision 2025 document underlines the need for “gender equality and the empowerment of women in all socio-economic and political relations and cultures”.

Building on these important policy documents, the Government of Tanzania needs to set its vision and define what it wants to achieve through a comprehensive gender equity strategy for higher education, based on the 2018-2021 National Strategy for Inclusive Education. This could be an individual document, could form part of a broader gender equity strategy for the education sector, or be a higher education sector strategy. The second step is to establish ambitious long-term goals and medium-term targets with clearly defined and measurable indicators.

Moving forward, the Ministry of Education needs to take ownership of the gender equity agenda for the higher education sector. This would involve setting up a steering committee and a governance structure responsible for elaborating and implementing the gender equity strategy. Considering the importance of the pipeline of qualified and motivated female secondary education graduates as a key determinant of progress in higher education, all decision-making actors at the higher education level must closely coordinate with their counterparts at the basic education level.

The Government could consider five types of financial measures to actively promote gender equity at Tanzanian universities: (i) tuition fees exemptions, (ii) scholarships and student loans, (iii) gender-specific incentives in the funding formula to allocate resources to public universities, (iv) performance contracts with a gender promotion dimension, and (v) competitive grants that universities would access to implement gender promotion activities.

With respect to non-monetary measures, the Government of Tanzania could intervene in the following manner to orient and support higher education institutions keen on increasing opportunities for access and success of female students in STEM programs, and to improve the gender balance

among senior academics and university leaders: (i) reformed admission procedures / quotas; (ii) anti-discrimination laws; (iii) anonymous research grant reviews; and (iv) basic education reform to improve the pipeline of young women studying science.

Institutional Policies

The first priority is to have a clear strategy formulated either as a stand-alone document or embedded in the institutional strategic plan. This allows higher education institutions to mobilize their community and stakeholders around common equity objectives and targets. Having an implementation framework and a bespoke department responsible for gender equity-related activities under the direct authority of an institutional leader is a second important factor of success. Further, partnerships between universities and firms can generate additional resources to finance scholarships for needy students.

To improve the gender balance among their students, Tanzanian universities should consider implementing a comprehensive set of measures that would promote access and success for female students, with a special focus on STEM programs and PhD programs, where the gap is more acute. Measures could be considered in the following areas: (i) outreach and bridge programs, (ii) affirmative action, (iii) retention, (iv) prevention of sexual harassment, (v) specific measures to support female PhD students and academics, (vi) role-modeling, and (vii) mentoring programs.

Summary

Below is a summary matrix of the various instruments that Tanzania can use to promote gender equity in higher education generally, and in STEM programs specifically, at the national and institutional levels. A summary of the recommended priority interventions and the suggested sequencing is included following the matrix.

Instruments for Gender Equity Policy in Tanzania

Instruments \ Policy Goal	STEM Programs	PhD Programs	Senior Academics	University Leaders
National Policies				
Tuition exemption	✓	✓		
Scholarships / Loans	✓	✓		
Funding Formula	✓	✓	✓	
Performance Agreements	✓	✓	✓	✓
Competitive Grants	✓	✓		
Quotas / Affirmative Action	✓	✓	✓	✓
Anti-Discrimination Laws	✓	✓	✓	✓
Anonymous Research Proposals			✓	
Basic Education Reform	✓			
Institutional Policies				
Tuition Exemption	✓	✓		
Scholarships/Loans	✓	✓		
Outreach/Bridges	✓			
Affirmative Action	✓	✓	✓	✓
Support for Retention	✓	✓		
Sanctions for Sexual Harassment	✓	✓	✓	
Mentorships	✓	✓	✓	✓
Support for Female Academics			✓	

Sequencing of Priority Interventions for Promoting Gender Equality in STEM Higher Education

Time Horizon	Priority Interventions	Responsible Institution
Short Term	Prepare a national gender equity strategy for higher education and identify long-term goals and medium-term targets with clear and measurable indicators	MoEST
	Prepare/strengthen gender equity strategy at the institutional level with clear goals and targets, especially for STEM, at the student and academic staff level	Higher education institutions
	Identify/set up specific department or unit for gender equity-related activities under the direct authority of an institutional leader and develop implementation plan for gender equity strategy	Higher education institutions
	Assess legal framework and institutional policies to protect students and academics from discriminatory behaviors, including sexual harassment and gender-based violence	MoEST, higher education institutions
Medium-Long Term	Introduce/strengthen career information and guidance system in high schools to increase awareness of STEM programs and career options	MoEST, higher education institutions
	Introduce affirmative action programs to encourage female students to enroll in STEM programs	MoEST, higher education institutions
	Provide scholarships for female students, especially at the PhD level, for STEM programs	MoEST, higher education institutions
	Develop mentorship programs to support female students and academics to grow professionally, strengthen networks, and develop leadership skills	Higher education institutions
	Reform the legal framework and institutional policies on the basis of the findings of the assessment (indicated as short-term policy)	MoEST, Higher education institutions
	Coordinate with the basic education sub-sector to address constraints to girls' achievement and interest in science and mathematics in primary and secondary school	MoEST

1. Introduction

Gender inequalities in STEM education and employment perpetuate existing gender inequalities in status and income. Gender equality in STEM will ensure that boys and girls, men and women will be able to acquire skills and opportunities to contribute to and benefit equally from the benefits and assets associated with STEM (UNESCO, 2017).

1.1 Background

Among the many dimensions of equity that can be measured in higher education: income, gender, minorities, students with disabilities, etc., gender is the area where most countries have achieved substantial progress in the past two decades. UNESCO Institute of Education enrollment statistics indicate that all countries have significantly increased female participation in higher education. In several regions of the planet, progress has been such that, today, significantly more women than men are enrolled in higher education. This is the case in all OECD countries, Central Asia, the Middle East and North Africa, as well as Latin America and the Caribbean. The two outliers are South Asia and sub-Saharan Africa (SSA), where fewer females are enrolled in higher education in comparison to the rest of the world. In South Asia, the proportion is 47.0 percent. Across SSA, females represent only 42.3 percent of all higher education students.[10]

With the share of female students in higher education enrollment at 38.5 percent in 2018, Tanzania is performing below the SSA average.[11] The situation of gender imbalance is more acute in STEM programs, where female students account for only 33.6 percent of the total student population. This is happening in a context of widespread gender-based violence, which is an outstanding issue in many parts of Tanzanian society, including in higher education institutions. A recent survey revealed that 40 percent of women and girls in Tanzania aged 15-49 have experienced physical violence and 17 percent have experienced sexual violence in their lifetime, seriously undermining the health and well-being of Tanzanian girls and women.[12]

The lack of gender balance has important detrimental effects. Given the extensive social and private benefits that higher education generates, ensuring inclusive access and success is essential to achieve social justice and economic efficiency by encouraging the realization of the full potential of all young people. Not only is gender equality a basic tenet of any democratic society, but, in addition, the fact that talented female students do not complete high school or are denied entry into higher education represents an absolute loss of human capital for the individual person and for society. The lack of opportunities for access and success in higher education leads to under-developed human resources and a resulting shortfall in the capacity to generate and capture economic and social benefits (Harbison, 1964; Bowen and Bok, 1998; Ramcharan, 2004). The Tanzanian economy is suffering shortages in many areas, especially STEM professions. The social sectors are also missing large numbers of qualified specialists. In the health professions, for instance, it is estimated that the manpower shortage is as large as 50 percent. And the education system needs many qualified teachers.

10 UNESCO Institute of Statistics data.

11 Authors' calculations based on data in TCU's State of University Education in Tanzania 2018

12 https://www.dfa.ie/irish-embassy/tanzania/news-and-events/latestnews/responding-to-covid-19-and-gender-inequalities-through-community-radio.html#:~:text=Genderpercent2Dbasedpercent20violencepercent20ispercent20widespread,sexualpercent20violencepercent20inpercent20theirpercent20lifetime.&text=Tanzaniapercent20reportedpercent20itspercent20firstpercent20case,19percent20onpercent2016percent20Marchpercent202020.

Furthermore, labor market data indicate that achieving strong results in science and mathematics is a determinant of later earnings, and that women with STEM degrees tend to have a higher income than women in non-STEM professions (Beede *et al*, 2011).

1.2 Objectives of the Policy Note

The main objectives of the Policy Note are to address the following key questions:

- What is the pipeline of young women studying science subjects in secondary education and what obstacles do they face?
- What are the main barriers preventing young women from participating on an equal basis in STEM higher education programs?
- What would be effective policies to offer greater access to, and improved learning outcomes for, young women in STEM programs in higher education?
- What effective policy levers (financial and non-monetary) can be used to bring about gender balance in STEM higher education programs?

1.3 Methodology

This Policy Note is principally informed by the following sources of information:

- Consultations with key government officials;
- Focus group conversations with a sample of female students and female teachers at both secondary education and higher education institutions;
- Focus group conversations with representatives of university leadership teams;
- Key informant interviews with UNICEF and non-governmental organizations (NGOs) active in supporting female education in Tanzania;
- Analysis of relevant databases, as well as national, regional and international statistics on various dimensions of tertiary education performance in Tanzania and SSA; and
- Desktop literature review of (i) official publications and policy documents of the Tanzanian Government, (ii) regional reports (Association of the African Universities, African Development Bank, UNESCO) and relevant studies produced by the Organization for Economic Cooperation and Development (OECD) and the World Bank, (iii) recent academic works on tertiary education reforms in OECD countries and Tanzania.

Whenever possible, the analyses take into consideration benchmarking data that put the gender balance situation in a regional and international perspective. Similarly, the policy options considered in this note are based on careful consideration of relevant international experience from countries facing similar challenges to those encountered today in Tanzania.

1.4 Outline of the Policy Note

This Policy Note starts with an analysis of the present gender balance situation in Tanzania, followed by a discussion of the main factors explaining the present situation. The second part considers a range of reform and development options that could improve the gender balance in the Tanzanian higher education system, with a special focus on STEM programs.

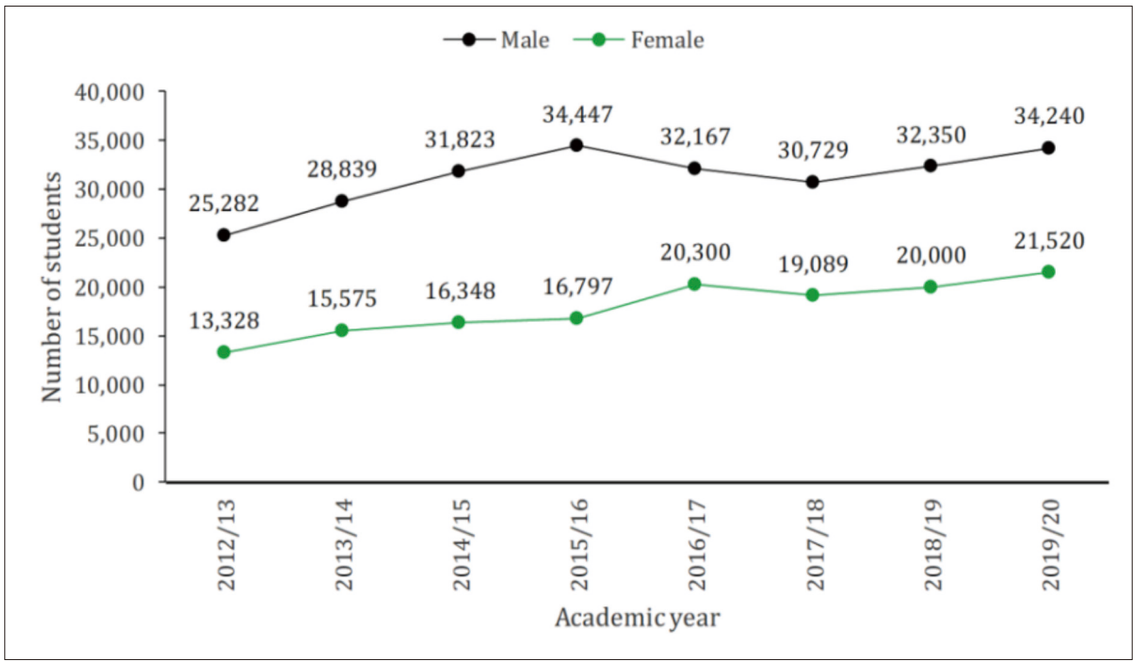
2. Gender Imbalances in Tanzanian STEM Higher Education

2.1 Diagnosis of the Present Situation

Analyzing gender imbalances in higher education involves considering four dimensions: (i) the gender distribution of student enrollment and graduation numbers; (ii) the gender distribution in STEM programs; (iii) female participation among academics; and (iv) female representation in leadership positions.

In the last decade, the proportion of new female students admitted into the Tanzanian higher education system increased from 34.5 percent to 38.6 percent between 2012 and 2019. Figure 1 shows the evolution of the male/female admission ratio over the same period.

Figure 1 – Evolution of Male-Female Admission Ratio in Tanzanian Higher Education (2012/13 – 2019/20)



Source: TCU 2020

Table 1 shows the gender distribution in enrollment by type of degree. The data indicate that, while the proportion of women is about the same as the national average for diplomas, bachelor's and master's degrees, it is substantially lower for doctoral students. At 26 percent, the proportion of female doctoral students is drastically lower than the world average of 43 percent, according to UNESCO statistics. This is of high concern because it means that the problem is likely to perdure over time as female students will not have many university female professors serving as role models. The proportion of female students enrolled in private higher education institutions is slightly higher than in the public sector, 41 percent versus 37 percent.[13]

13 Author calculations based on TCU 2019

Table 1 - Share of Female Students by Type of Degree in Tanzania (Percent) (2017/18)

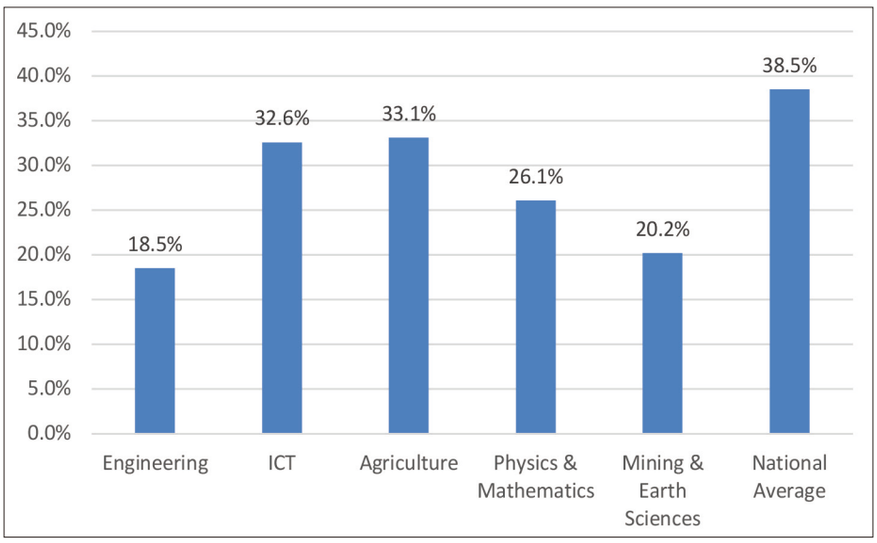
Degree	Certificate & Diploma	Bachelor	Master	PhD	Total
Proportion of Female Students	36.7	37.2	39.6	25.8	38.5

Source: Author calculations based on TCU 2019

With regard to the type of institution attended, female students represent 39.1 percent of the total student population in fully fledged universities, 33.5 percent in university colleges, and 44.9 percent in other kinds of institutions.[14]

More worrisome from an economic development perspective is the high level of gender imbalance in STEM programs, as illustrated by Figure 2, which shows the share of female students enrolled in a selection of STEM programs. A smaller share of female students is enrolled in STEM programs compared to the average share of female students across all higher education programs (38.5 percent). In engineering, for instance, the share of female students is below 20 percent, much less than the 25 percent average in the United States. The overall proportion of women in higher education STEM programs has been growing at a very slow pace. For example, the proportion of female students in STEM programs has gone from 33.2 percent in 2018 to 33.6 percent in 2019.[15]

Figure 2 – Proportion of Female Students in STEM Programs in Tanzania (2017/2018)



Source: TCU 2019

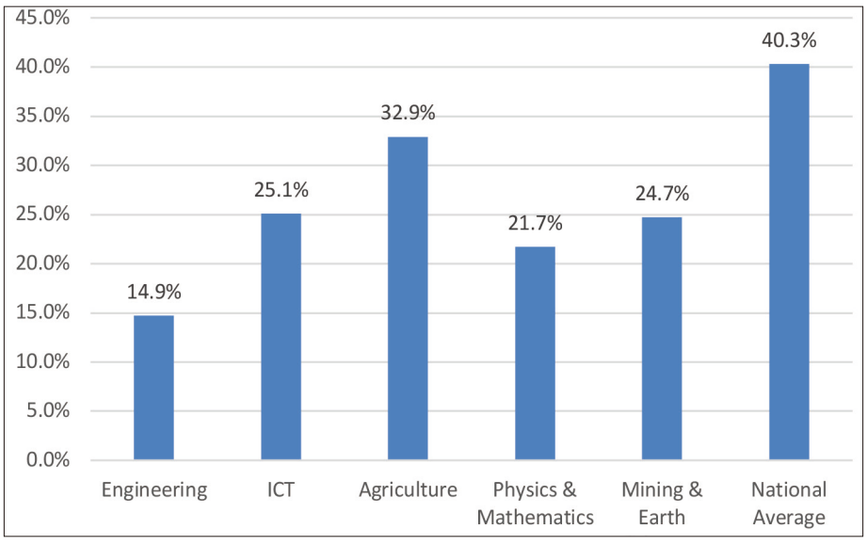
In addition, the probability of being successful at the end of their studies in STEM programs is lower for female students than their male counterparts. On average, the proportion of female graduates in STEM programs is 30.1 percent. Figure 3 reveals the proportion of female graduates in various programs. With the exception of Mining and Earth Sciences, the proportion of females that graduates is considerably lower than the enrollment proportion.

14 Author calculations based on TCU 2019

15 Author calculations based on TCU 2019 and TCU 2020

While there could be additional equity factors besides gender that impact enrollment and graduation rates of students, such as their socio-economic background and/or their location (urban/rural), the absence of sufficient data in this regard prevented further analyses in these areas.

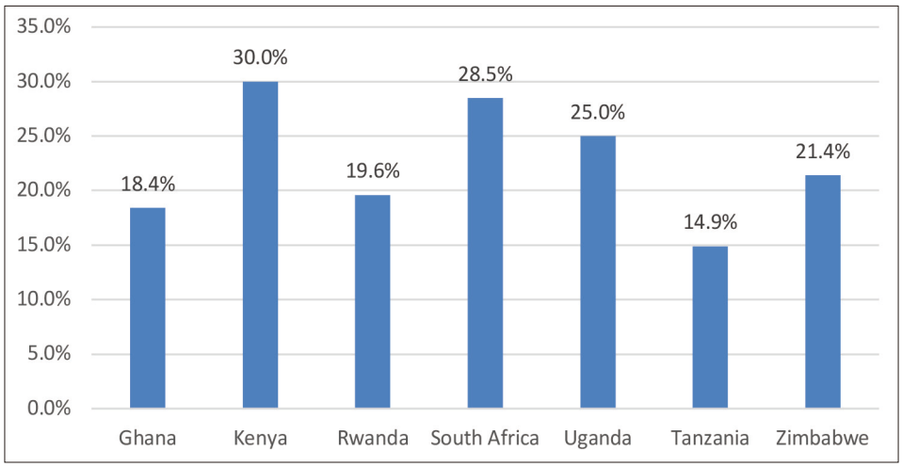
Figure 3 – Proportion of Female Graduates in Tanzanian STEM Programs (2013-2017)



Source: TCU 2019

At the regional level, Figure 4 compares the share of women among engineering graduates across a few SSA countries, confirming the unfavorable situation in Tanzania, which comes last among the seven countries compared in this graph. Similarly, in agricultural sciences, the proportion of Tanzanian female graduates (33 percent) is significantly lower than in the following eight countries in the sub-region, which report a share of women graduates of 40 percent or more: Lesotho, Madagascar, Mozambique, Namibia, Sierra Leone, South Africa, Swaziland and Zimbabwe (UNESCO, 2017).

Figure 4 – Share of Females Among Engineering Graduates in Selected SSA Countries (2018 or most recent year)

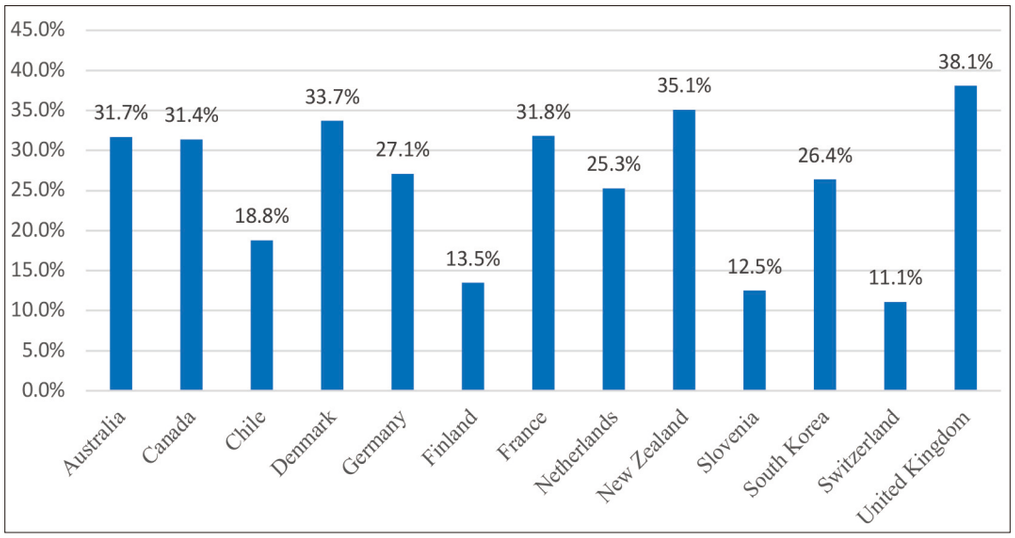


Source: UNESCO Institute of Statistics

To put the Tanzanian situation in an international perspective, Figure 5 illustrates the degree of gender imbalance in STEM programs in a number of OECD countries, showing the lowest results in

Chile, Finland, Slovenia and Switzerland. This international comparison reveals that, even though Tanzania has a lot of progress ahead, the present situation compares to countries globally, except perhaps in engineering education. Most countries around world struggle with graduating sufficient numbers of women in STEM.

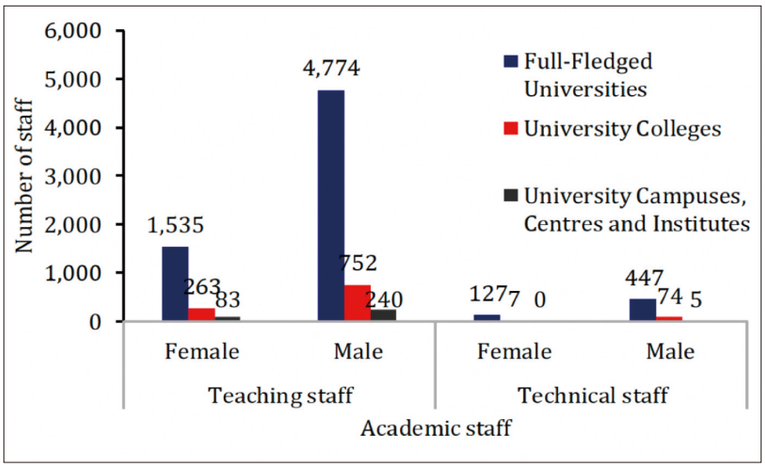
Figure 5 – Share of Female Graduates from STEM Programs in OECD Countries (2018)



Source: UNESCO Institute of Statistics

The significant gender imbalance in higher education exacerbates inequalities in professions in Tanzania, meaning that fewer women leaders can be found in research and innovation, government, businesses and civil society organizations, and in universities' academic staff as well. Only 24.3 percent of university lecturers are women. Figure 6 shows the gender distribution of university staff by type of institution and category of academic staff.

Figure 6 – Gender Distribution of Academic Staff in Tanzanian Higher Education Institutions (2018)



Source: TCU 2019

Private higher education institutions tend to have a better gender balance than public universities: the proportion of female academics was 31 percent in the former group of institutions, compared to

only 26 percent in the latter group. Table 2 compares the proportion of female students and female academics in a selection of STEM programs. The data confirm that, with the exception of mining and earth sciences, the proportion of female academics is significantly lower than the share of female students. Fewer female students go on to pursue and succeed in academia in these programs. For example, while ICT programs enroll 33 percent women, females represent only 23 percent of the academics in this discipline. These results likely have an adverse effect in terms of positive role models for aspiring female STEM students.

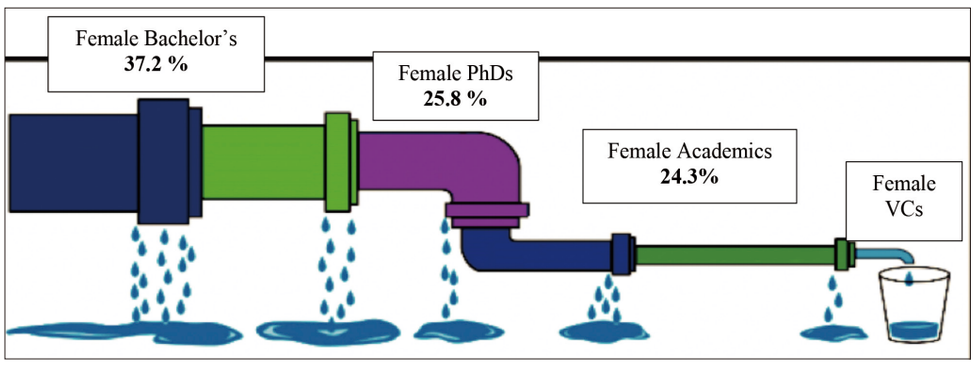
Table 2 – Proportion (%) of Female Students and Academics in Tanzanian STEM Programs (2018)

Degree	Agriculture	Engineering	ICT	Mining & Earth Sciences	Physics & Mathematics
Proportion of Female Students	33.1	18.5	32.6	20.2	26.1
Proportion of Female Academics	31.5	16.9	23.3	21.6	17.2

Source: Author calculations based on TCU 2019

Figure 7 depicts the leaky pipeline as women progress in their higher education careers, especially in STEM fields. There is a smaller share of female representation at increasingly advanced or senior levels. For example, women start out constituting 37 percent of the total enrollment at the Bachelor's level but by the time they get to the PhD level, they represent only 26 percent of all doctoral students. Even fewer women advance to become university professors and lecturers (24 percent) and ultimately lead higher education institutions as vice chancellors.

Figure 7 – Pipeline of Females in the Tanzanian Higher Education System



Source: Authors' elaboration based on TCU 2019

2.2 Determinants of Gender Disparities

> *Gender discrimination and differentiation persists at all levels of the formal education system, in spite of government efforts to promote equity in its social policies. Women have had less access to education in terms of quantity of enrolment, they tend to be concentrated in gender stereotyped subjects, and they continue to have less access to higher positions in the labour market and household economy, as well as decision-making at all levels, including the educational hierarchy. The school learning and teaching process, including pedagogy, continues to rely on authoritarian methods and the school environment is marked by macho elements of rough competition and physical punishment (UNESCO, 1997).*

Understanding the determinants of gender disparities in STEM higher education programs in Tanzania requires a pathway analysis that looks at two critical stages that affect the pipeline of girls and women: (i) from early childhood to the end of high school; and (ii) access and success in higher education (Hammond *et al*, 2020). In each case, the Policy Note takes two types of barriers into consideration: financial obstacles that may affect girls more than boys, and structural, non-monetary barriers that prevent young women from accessing and being successful in higher education STEM programs.

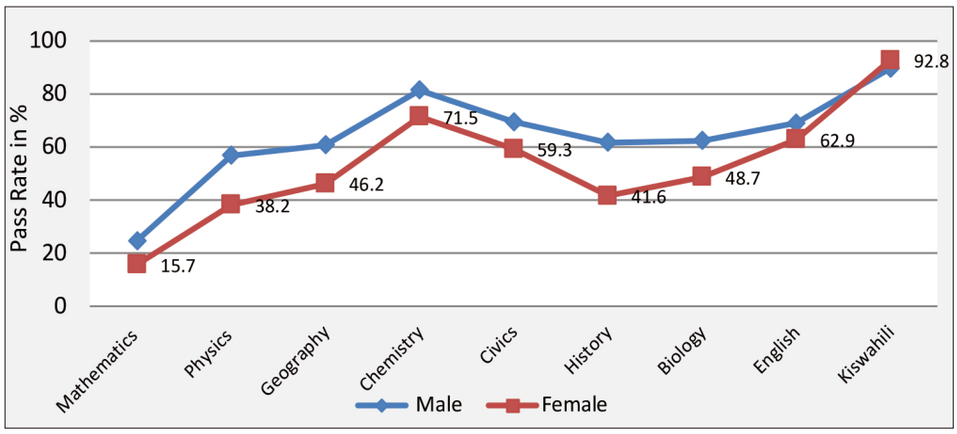
2.2.1 The Path to Higher Education

The pool of female high school graduates likely to enter higher education is determined, in the first instance, by what happens or does not happen in secondary education. There is a direct link between the outcomes for young women in lower levels of education and their outcomes in higher education. In Tanzania, the challenge starts with the transition from primary to lower secondary education. While more girls than boys reach the end of primary school, a slightly smaller proportion continue onto secondary school. In 2019, for example, 75.7 percent of girls entered the first grade of secondary, compared to 76.7 percent of boys.[16]

Once enrolled in lower secondary, girls and boys alike experience high drop-out rates, peaking after examinations at the end of Form 2.[17] Overall, 74 percent of the girls and 72 percent of the boys that begin lower secondary complete it. The most common reason for leaving school for both boys and girls is truancy. For girls, pregnancy is also a reason for dropping out.

There is a sharp drop in the number of students, particularly girls, who transition from lower to upper secondary. In 2018, the transition rate between lower and upper secondary for girls was 22 percent compared to 31 percent for boys. These lower female transition rates are partly the result of poorer female performance in the O Level examinations (taken at the end of Form 4),[18] which determine whether students can continue into upper secondary (Figure 8). Overall, for every 1,000 girls that start lower secondary, only 158 complete upper secondary, compared to 216 boys.[19]

Figure 8 – Lower Secondary School Examination Results in Tanzania (2019)



Source: MoEST AESPR, 2020

16 MoEST Basic Education Statistics Tanzania (BEST) 2020

17 Form 2 is equivalent to Grade 8

18 Form 4 is equivalent to Grade 10

19 MoEST BEST 2018

Young women's interest and performance in science and mathematics is influenced by their environment as they grow up and move through the different levels of school. Research overwhelmingly points to the profound influence of sociocultural factors in explaining gender gaps in STEM disciplines. Stereotypes about which gender is more talented in mathematics and science and more able to work in STEM positions are a critical driver of the gap between girls and boys (Fiske *et al.*, 2014). They determine the psychological factors, such as aspirations, identity, interests, mindsets, motivation, and self-confidence, that influence the students themselves, their peers, parents and teachers. Notwithstanding common assumptions about boys having superior innate abilities giving them an edge over girls for the study of STEM subjects, there is no scientific evidence to explain disparities in mathematics and science results on the basis of biological differences (Blickenstaff, 2005; Ceci and Williams, 2007; UNESCO 2017).

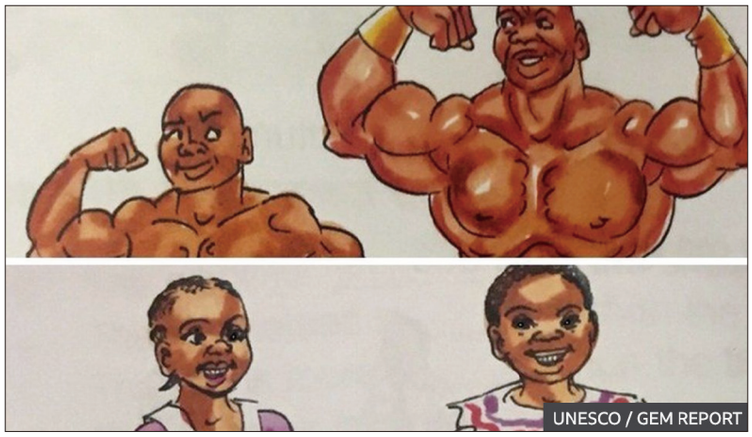
> A wide range of sociocultural forces contribute to sex differences in mathematics and science achievement and ability—including the effects of family, neighborhood, peer, and school influences; training and experience; and cultural practices. We conclude that early experience, biological factors, educational policy, and cultural context affect the number of women and men who pursue advanced study in science and math and that these effects add and interact in complex ways (Halpern *et al.*, 2007).

Evidence from various parts of the world indicates that stereotype threats negatively influence academic performance by inducing young women to worry that low performance could confirm the negative views about their ability to be successful in science subjects. In that way, stereotype threats amplify gaps in academic performance between girls and boys. In particular, negative stereotypes about the ability of secondary school girls to have good results in science tests and undermine their aspirations to embrace STEM careers (African Academy of Science, 2020).

The foundations for a STEM career are laid in the early stages of a child's schooling. Children are socialized to learn about gender in early years in life as they encounter gendered roles and expectations. Girls are therefore oriented to be communal (e.g., socially skilled and helpful), focus on children and family, and are more likely to be engaged in activities that emphasize interpersonal relationships. On the contrary, masculine gender role stereotypes orient boys to acquire mastery, skills and competence, explore the physical world, and figure out how things work. Therefore, boys are likely to be involved in activities that emphasize problem solving, status, and financial gain. Research from multiple countries point to a trend where children often hold stereotypical views about STEM courses being for boys and non-STEM ones for girls (African Academy of Science, 2020, p. 13).

Textbooks, in particular, often reflect common stereotypes about culturally-determined roles for boys and girls. They influence, in turn, the decisions young women make about what subject to put their efforts into and what careers they should aspire to. In Tanzania as in many other SSA countries, women tend to be under-represented in textbooks, or depicted with traditional images, as illustrated by Figure 9. This cultural bias is important to explain young women's motivation, or lack of, to study mathematics and science, as boys are generally associated with STEM professions while girls are expected to become housewives and mothers. As analyzed in the Global Monitoring Report, "curricula exclude when they do not cater to learners' diverse needs and do not respect human and citizenship rights. Textbooks can perpetuate stereotypes by associating certain characteristics with particular population groups. Inappropriate images and descriptions can make students with non-dominant backgrounds feel misrepresented, misunderstood, frustrated, and alienated (UNESCO, 2020, p. 113).

Figure 9 – Strong Boys and Pretty Girls in a Tanzanian Textbook



Source: https://www.bbc.com/news/world-41421406

Teachers are also prone to perpetuate these stereotypes either in a deliberate manner or without being aware of their own biases. These biases can manifest themselves in many ways: different teaching methods and attitudes towards boys and girls, different sets of expectations, discouraging comments towards girl students, etc. (Hammond *et al*., 2020).

Among the reasons explaining the low performance and high dropout rates of Tanzanian girls at the secondary level is the fact that secondary schools often do not offer a safe and supportive learning environment (World Bank, 2019). In the first place, the insufficient number of government-run (public) schools results in long distances to school for many students and increased physical risks faced by girls in travelling to and from school. In 2017, approximately one third of girls enrolled in secondary school had to travel over three kilometers to their closest school. Lack of reliable and safe transport to and from school are key contributing factors to dropout and low female transition rate from primary to lower secondary school. In 2019, the average distance to school was 2.8 km and a 2019 Local Government Authority (LGA) survey identified distance to school as the top reason for dropout.

School-related violence is a particularly worrisome phenomenon. A recent survey has highlighted the prevalence of violence: 47.3 percent of secondary students in Tanzanian public schools had experienced psychological violence and 21.0 percent some form of physical violence six months before the survey (Hakielimu, 2020). Incidence of psychological and physical violence is higher for female students than male students, especially in the case of physical violence (24.9 percent for females versus 16.2 percent for males). Furthermore, 19.3 percent of female students from public schools reported experiencing at least one incident of sexual violence, compared to 14.7 percent of female students from private schools (Hakielimu, 2020).

Adolescent pregnancies and early marriage also contribute to student drop-out. In 2015, approximately 24 percent of girls aged 15-19 years were married and most births by adolescents take place within marriage. In 2017, about 1 percent of girls enrolled in secondary school (5,443), dropped out due to pregnancy.[20] Adolescent pregnancy among 15-19-year-olds is almost four times higher among the poorest, with 42 percent in the poorest income quintile compared to 13 percent in the richest quintile. Outside early marriage, the main causes of pregnancy include the low level of knowledge on reproductive health, sexual violence, and poverty-related transactional relationships with men. If a school girl becomes pregnant in the government system, she has to leave the government

20 MoEST AESPR 2018

school and find an alternative education pathway. The 2019 LGA survey identified three challenges hindering girls' return to education: (i) poverty; (ii) long distance to alternative education centers; and (iii) stigma in the community and family regarding young mothers' continued education.

On the home front, studies conducted in the late 1990s showed that in time of crisis, parents living in poverty generally made decisions that would sacrifice their daughters' education and protect that of their sons, reflecting the patriarchal culture still prevalent in Tanzanian society.

> Although parental attitudes toward education may not be negative, when difficult choices have to be made, it is girls' education that is sacrificed first. Furthermore, factors such as family poverty, the need for children's labor on farms and in fields, schoolgirl pregnancy, mandatory student participation in a variety of nonacademic tasks (such as raising funds for the school), distance to school, lack of safety for girls in school, and the perennial responsibility of girls for gender-specific tasks such as food preparation and other household chores compound the problems girls face in attaining education (Bendera and Mboya, 1998).

Inadequate school infrastructure, such as water, sanitation, and hygiene facilities for menstrual hygiene management also affects regular class attendance of girls. This is amplified by limited academic support to girls, frequent occurrences of violence against girls both in school and outside school, non-gender-sensitive teaching approaches, and insufficient time to study at home because of household chores. All these factors significantly affect the ability of Tanzanian girls to continue their education. Availability of electricity is another contributing factor. As of 2020, only 25.4 percent of rural areas have access to electricity.[21] This means that neither schools nor households are connected in many villages, seriously constraining learning opportunities for both boys and girls in rural areas. Thus, the foundations for girls to pursue higher education, especially STEM disciplines, are established during their schooling years, particularly secondary school, as it ensures their preparation for post-secondary education.

2.2.2 Access and Success of Female Students in Higher Education

In 2015, the secondary education system produced fewer than 13,000 successful mathematics and science graduates, equivalent to only one percent of the relevant age cohort. This has direct consequences for enrolment in STEM programs in higher education. Male-female differences in higher education enrollment stem from low female transition rates from lower to upper secondary schools, as discussed in the previous section, and again from upper secondary to university. While 48 percent of girls passed the Certificate of Secondary Education Examination (CSEE) or O Level examination, only 38 percent passed the Advanced Certificate of Secondary Education Examination (ASCEE) or A Level examination. Female students tend to have lower pass rates than males in scientific disciplines in both examinations, though the difference is particularly pronounced at the O Level. For example, only 16 percent of girls pass basic mathematics O Level examinations compared to 25 percent of boys (Figure 10). Results at A Levels are better overall for boys and girls in STEM subjects, although girls still fall behind boys in subjects like advanced mathematics (83 percent versus 88 percent pass rate) (Figure 11). The differences in performance are smaller at the A Level and girls do marginally better in some subjects like physics. The reasons for girls' poorer performance are discussed in the previous section, though the difference at the O Levels compared to A Levels merits further investigation.

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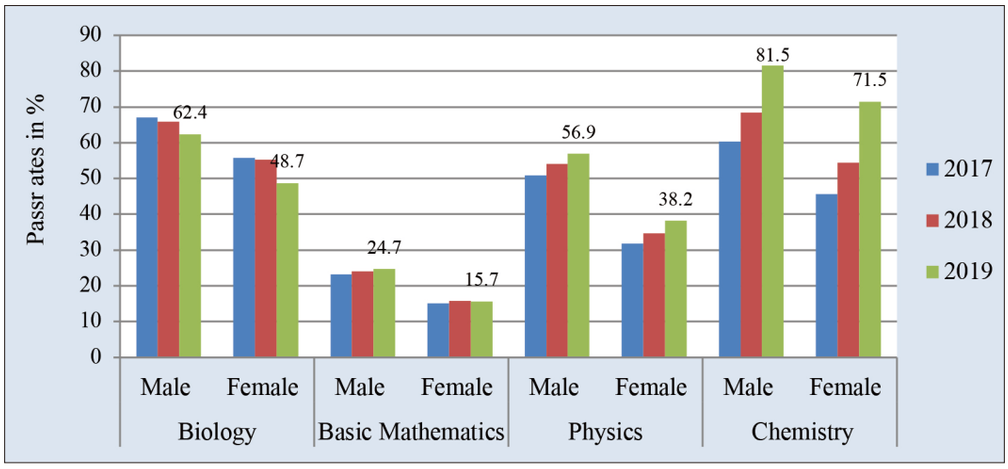
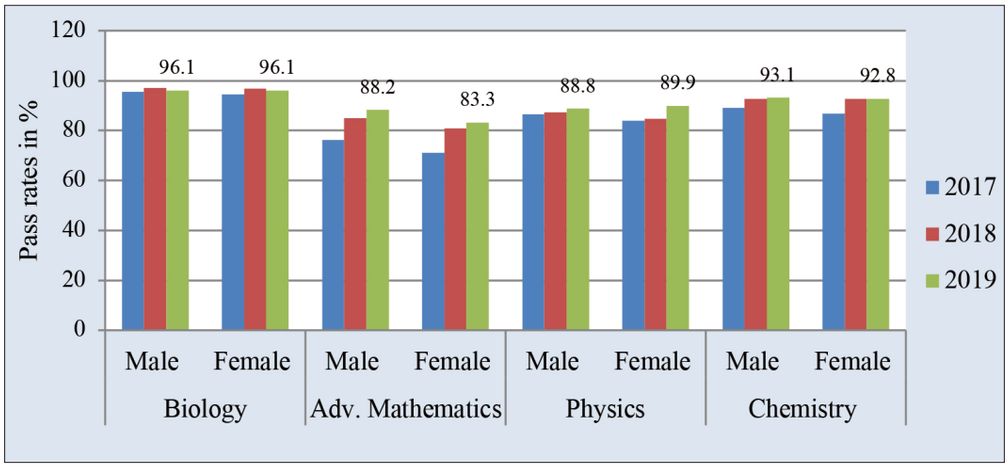
21 https://energypedia.info/wiki/Tanzania_Energy_Situation. Some sources suggest a higher level of electrification – up to 78 percent public schools in lower secondary.

Figure 10 – Tanzania CSEE Science Subjects Results by Gender (2017-19)



Source: MoEST-AESPR 2020

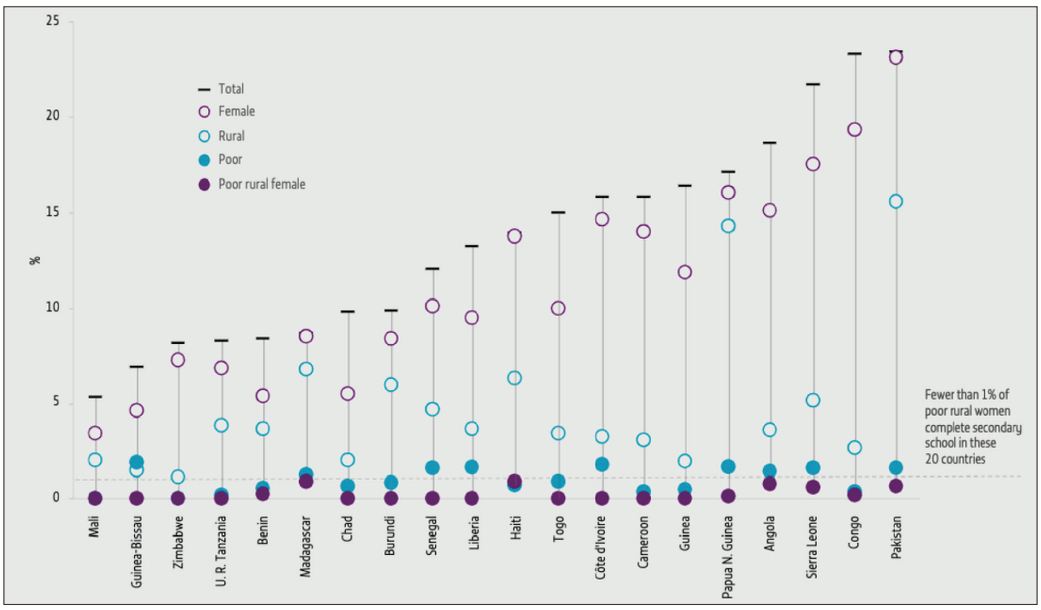
Figure 11 – Tanzania ACSEE Science Subjects Results by Gender (2017-19)



Source: MoEST-AESPR 2020

Tanzania is among the twenty countries in the world where hardly any girl from a poor rural household completes upper secondary education, as analyzed by UNESCO's Global Monitoring Report (Figure 12). This prevents girls from poor rural households from pursuing higher education.

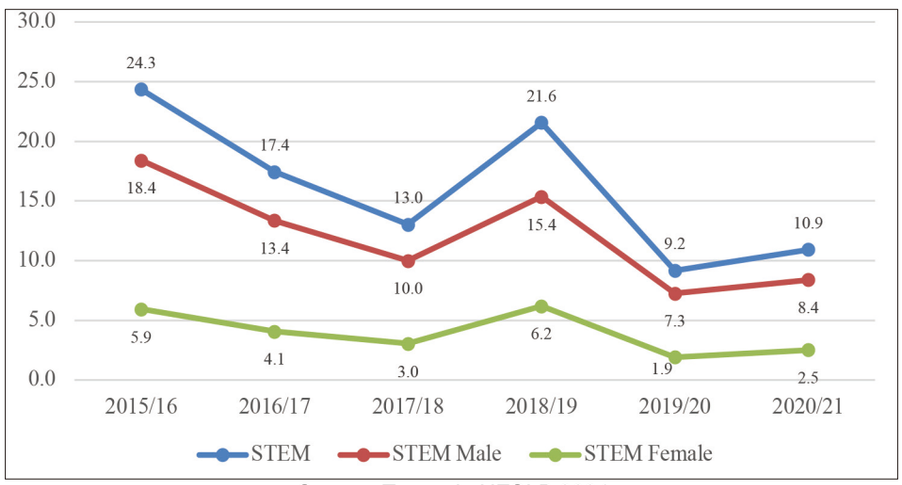
Figure 12 – Countries Where Few Poor, Rural Girls Complete Upper Secondary Education (2013-18)



Source: 2020 Global Monitoring Report, p. 68

In addition, a review of student loan data from the Higher Education Student Loans Board (HESLB) shows low financial support in the form of loans for female STEM students. Figure 13 shows that the proportion of female STEM students among the overall student loan beneficiaries has not only been significantly lower than that of male STEM students but has also been on a declining trend. While the reason for this trend cannot be determined due to limited access to loan applicants' data, financial aid through HESLB for female students pursuing higher education STEM programs is limited.

Figure 13 – Trends in distribution of higher education student loans among STEM students (2015/16-2020/21)



Source: Tanzania HESLB 2021

Once female students are enrolled in STEM programs, they tend to obtain better academic results than their male counterparts, which indicates that the main problem faced by women is one of access, rather than academic ability to succeed once they have been admitted into STEM programs. In the

absence of comparative data on grades achieved by male and female students, Table 3 compares the share of female students in STEM disciplines and the proportion of women among students who drop out in these programs as a proxy of academic performance, albeit an imperfect one. The lower dropout rates clearly show that female students perform better than male students across the board and achieve the results to continue in their programs, confirming that the key obstacle is not one of academic deficit, but of insufficient pipeline from secondary education, aggravated by access barriers at the tertiary level. Female dropouts form as little as 9 percent of the total number of students who drop out in programs like Agriculture, and 12 percent in Physics and Mathematics.

Table 3 – Proportion (%) of Enrolled Female Students and Female Dropouts in Tanzanian STEM Programs (2013-2017)

Degree	Female Students	Female Dropouts
Agriculture	36.7	8.8
Engineering	37.2	18.6
ICT	39.6	35.4
Mining & Earth Sciences	25.8	12.8
Physics & Mathematics	38.5	12.0
National Average	38.5	27.4

Source: TCU 2019

Experience in other SSA countries, and elsewhere, indicates that the smaller share of female academics is not only the result of the lower share of female students in higher education overall, but equally due to greater difficulties in getting permanent positions, being promoted, accessing research funding, and being considered for leadership roles in a world where men occupy most power positions.

> Getting more women into science is not working. A combination of factors reduces the proportion of women at each stage of a scientific career: the graduate-level environment; the maternal wall/glass ceiling; performance evaluation criteria; the lack of recognition; lack of support for leadership bids; and unconscious gender bias. … Female students were more likely to encounter problems with their supervisor such as favouritism or victimization, or to feel that their supervisor was oblivious to their personal life, or to feel isolated from their research group. They were also more likely to be uncomfortable with the research culture of their group in terms of working patterns, work hours and competition among peers. As a result, female students viewed an academic career as offering a solitary existence; they felt intimidated by the competitive atmosphere and that an academic career demanded too much of a sacrifice from them concerning other aspects of their life. … In some countries, once women have embarked on a scientific career, their trajectories tend to be less stable than those of men and characterized by shorter term and temporary work, rather than full-time positions. Some of these challenges stem from a working and research environment where women are expected to fit in and 'become one of the boys' rather than one which encourages flexible working arrangements to accommodate the life situations of both women and men. In East Africa, barriers facing female researchers include difficulty in travelling to conferences or in participating in field work, on the assumption that they are the primary domestic caregiver at home. The maternal wall is supplemented by the 'glass ceiling', whereby a woman's performance tends to be more closely scrutinized than that of men, obliging women to work harder to prove themselves (UNESCO, 2015, p. 98)

The interviews conducted to inform this Policy Note revealed that, in spite of official policies to avoid gender discrimination and increase the presence of females in scientific studies and academia, the kind of cultural and social barriers described in the above UNESCO report deter effective operationalization of the instituted policies. The negative stereotypes and biases about young women's capabilities in STEM in lower levels of education carry over into higher education and academia with women's competence often considered less than that of men. In Tanzania, like elsewhere, women carry the bulk of the household chores and responsibilities. They do not always receive the support needed to simultaneously pursue their academic ambitions and take care of their families. Additionally, if a woman decides to take a few years off to start a family and raise her small children, she may find it difficult to resume her scientific career.

> "Society's expectations for girls are to get married early and stay at home after the first child is born. Families feel it is not worth investing in a girl because once she gets married, she goes to another family and no longer carriers the family name."
>
> "Women are responsible for more household work compared to men. This gives them less time for their academic projects and prevents them from giving it their full focus."
>
> "STEM is for boys, not for girls. There is a strong bias against women's capabilities in STEM. These careers are not considered fit for women."
>
> *Testimonies from female academics interviewed in March 2021*

Furthermore, it would appear, based on the interviews, that bullying, sexual harassment and gender-based violence remain prevalent in the academic world across public and private universities. Both female students and academics indicate that the gender policies in place in higher education institutions are not well implemented, leaving female students vulnerable to male students and lecturers. Interviews revealed that frameworks for the implementation of the policies are weak or absent. Even if universities have gender desks to address gender issues, there are poor mechanisms to address gender-based violence and often limited recognition of what qualifies as gender-based violence. Accountability measures also tend to be weak.

2.2.3 Impact of COVID-19 on Female Students and Academics

An international study assessing the impact of COVID-19 on higher education worldwide revealed that female students and academics have been affected more severely than their male counterparts (Salmi, 2020). As a result of the pandemic, youth unemployment has spiked, and many students cannot pay tuition fees and related expenses. Young women, in particular, are facing the highest rates of unemployment in many countries. The female students interviewed for this Policy Note mentioned an increase in on-campus prostitution as a result of increased poverty and inadequate financial support for students.

At home, female students and academics are expected to take a higher share of domestic chores and caregiving while continuing with their studies or academic duties. While no systematic information is available in Tanzania, studies in other parts of the world have reported a drop-off in the rate at which women were authoring research during the lockdown periods (Baker, 2021). In many fields, the technical and detail-oriented nature of research work means that academics need long uninterrupted stretches of time to think carefully. Finding the time and maintaining the emotional balance for that work is often difficult, if not impossible, when female researchers must also care for young children or supervise the learning experience of older children. As revealed in a recent New York Times article,

"Several studies have found that women have published fewer papers, led fewer clinical trials and received less recognition for their expertise during the pandemic" (Mandavilli, 2021).

The interviews conducted for the preparation of this Policy Note have confirmed the additional difficulties faced by female students and academics in Tanzania. Moreover, available information seems to indicate that, in East Africa, pregnancy rates for young women in upper secondary and higher education jumped up at alarming rates during the pandemic's closures. This may result in the removal of a cohort of talented young women from the higher education pipeline, at least for the immediate future (Malee Bassett, 2021).

3. Improving the Gender Balance in STEM Higher Education

No country today can afford to leave aside 50 percent of its creative genius, 50 percent of its innovation, 50 percent of its economic drivers.

Irina Bokova, Former Director General of UNESCO

3.1 Policy Framework

An essential factor to strengthen the quality of teaching, learning and research in Tanzanian universities is to improve the gender balance by significantly increasing the proportion of young women enrolled in STEM programs and PhD programs generally, among senior female academics, and among university leaders. Efforts to that effect are needed not only from an equal opportunity and social justice viewpoint, as mentioned in the Introduction, but, equally importantly, because diversity among students, academics, and university leaders is known to produce better results in terms of academic excellence and decision-making capacity in universities, as demonstrated by several pieces of research (for example, Woolley and Malone, 2011; Page, 2008).

International experience suggests that a comprehensive approach is needed to be successful in promoting and achieving a better gender balance in higher education (in general) and STEM programs (in particular). Comprehensiveness must be considered along two important dimensions. First, the examples of countries achieving the best results indicate that they rely at the same time on national- and institutional-level interventions that complement each other. Indeed, making progress on gender requires concerted actions at both the national and institutional levels, as outlined in the next sections. Second, these interventions must combine both financial and non-monetary measures (Salmi, 2018 and 2019). Figure 14 shows a Theory of Change that seeks to explain how these various dimensions are articulated.

3.2 National Policies

Based on the framework presented in the previous section, the Government of Tanzania could consider the following set of complementary policies and measures: (i) formulation of a vision and a strategy for gender equality in higher education; (ii) establishment of specific goals and targets for implementing the strategy; (iii) adoption of a regulatory framework to implement the gender policy in higher education; (iv) definition of adequate governance arrangements; (v) human capacity for gender development; (vi) financial resources to implement gender policies; and (vii) non-monetary interventions.

3.2.1 Vision and Strategy

The Government of Tanzania has adopted several relevant policies that provide the framework for the formulation of a specific higher education gender balance policy. The most important document is the Women and Gender Development Policy issued in 2000 by the then Ministry of Community Development, Women's Affairs, and Children. The policy document provides guidelines on women and gender development and integration of gender equality in policies, plans and development strategies. It called for the establishment of gender focal points in all national and local Government structures. Another relevant document, published in 2011 by the Ministry of Health, is the National Policy Guideline for the Health Sector Prevention of Gender-Based Violence. This was followed by the launch in 2017 of the National Plan to End Violence Against Women and Children (NPA-VAWC). Finally, the Tanzanian Government's Vision 2025 document underlines the need for "gender equality and the empowerment of women in all socio-economic and political relations and cultures".

Building on these important policy documents, the Government of Tanzania needs to set forth its vision and define what it wants to achieve through a comprehensive gender equity strategy for higher education, building on the 2018-2021 National Strategy for Inclusive Education (NSIE). The strategy could be an individual document or it could form part of a broader gender equity strategy for the education sector or a broader higher education sector strategy. The strategy should mention the range of financial and non-monetary instruments that the Government is planning to rely on for implementing the gender equity strategy. As an example of another sub-Saharan African country that has made strong policy statements on the topic of gender parity in higher education, Nigeria has recently outlined, in its blueprint for the future of higher education, the following five strategic objectives: (i) achieving parity in admissions, (ii) achieving gender equity in employment, (iii) increasing gender representation in leadership positions, (iv) eradicating sexual harassment, and (v) achieving a higher proportion of females in science and technology courses.

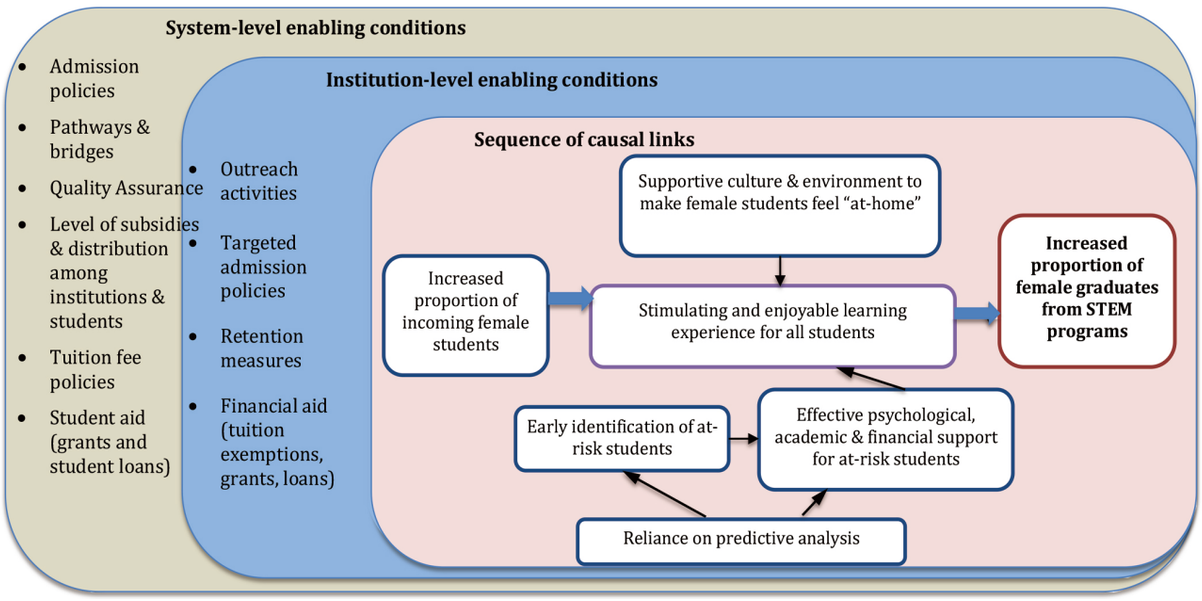
3.2.2 Goals and Targets

The second step is to establish ambitious long-term goals and medium-term targets with clearly defined and measurable indicators, such as number and proportion of females graduating from STEM programs, proportion of female graduates actually working in their field of study after graduation, number and proportion of female students entering STEM programs, number and proportion of young women graduating from secondary school with a science major, proportion of senior female academics, proportion of female university leaders (vice-chancellors, deputy vice-chancellors and faculty deans). Progress towards these targets should be closely monitored at the national and institutional level.

3.2.3 Regulatory Framework

The Government needs to ensure that adequate legislation is in place in the higher education sector in areas where important elements may be missing (gender discrimination, enforcement of quotas, affirmative action, sexual harassment, etc.). A 2014 study found that, despite recent progress, the legislative framework to combat gender-based violence was insufficient and that Tanzania lagged behind other SADC countries such as South Africa and Namibia (TAWLA, 2014). It is also essential to include, in the quality assurance framework, evaluation and accreditation criteria that look explicitly at equity in general, and gender balance.

Figure 14 – Theory of Change for Promoting Gender Equity in STEM Programs



Elaborated by Jamil Salmi

3.2.4 Governance

Complementing the work of the Ministry of Health, which has the overall responsibility for promoting gender balance in the country, the Ministry of Education, Science and Technology (MoEST) and the Tanzania Commission for Universities (TCU) should work together to formalize a dedicated higher education equity policy that would include a strong gender promotion policy. The previous Higher Education Development Plan, which finished in 2015, had already given priority to improved gender equity. Moving forward, MoEST needs to take ownership of the gender equity agenda for the education sector. This would involve setting up a steering committee and a governance structure responsible for elaborating and implementing the gender equity strategy. Given the importance of the pipeline of qualified and motivated female secondary education graduates as a key determinant of progress in higher education, all decision-making actors at the higher education level must closely coordinate with their counterparts at the basic education level.

3.2.5 Human Resources

Without adequate human resources to implement the gender equity plan, progress will remain uncertain. The Government must build the necessary technical capacity and set aside sufficient human resources that are ear-marked for the implementation of the proposed policies.

3.2.6 Financial Measures

The Government of Tanzania could consider five types of financial measures to actively promote gender equity among Tanzanian universities: (i) tuition fees exemptions, (ii) scholarships and student loans, (iii) gender-specific incentives in the funding formula to allocate resources to public universities, (iv) performance contracts with a gender promotion dimension, and (v) competitive grants that universities would access to implement gender promotion activities. Australia and South Africa are two examples of countries that have been pioneers in using the kinds of financial instruments mentioned under (iii) and (v) (Salmi, 2019).

Tuition fee exemptions

The Tanzania Commission for Universities could decree that female students enrolled in STEM programs run by public universities be exempted from paying any kind of tuition or related fees, or at least benefit from a partial exemption. This is common practice in countries as diverse as Pakistan and the United States. The budget allocated to these institutions should, of course, take this measure into consideration to compensate for any possible revenue shortfall.

Scholarships and loans

Dedicating scholarships and loans specifically to female students enrolled in STEM programs, in both public and private accredited universities, would be an important measure to complement tuition exemptions. This would be especially vital for low-income students and students coming from rural areas. The interviews conducted for this Policy Note revealed a perception of lack of transparency in the way scholarships are allocated among female students. It would be important to introduce more accountability in the criteria and processes applied to allocate scholarships throughout the higher education system.

Funding formula

Should the Government of Tanzania move to a funding formula to allocate funds for recurrent expenditures among the public higher education institutions, it could include, in the mathematical formula, a link between the amount of resources each institution gets and an indicator of progress towards gender balance in STEM programs and among senior academics and university leaders. Austria is an example of country that has taken the lead, worldwide, in using its funding formula to promote gender equity in higher education (Salmi, 2019).

Performance contracts

Performance contracts are non-binding agreements, negotiated between governments and higher education institutions, defining a set of mutual obligations. In return for the participating universities' commitment to meeting the performance targets established in the agreement, the government provides additional funding. Tanzania could use this kind of instrument to promote gender equity at two levels, first, with respect to the presence of female students in STEM programs, and second, in order to promote better gender balance among senior academics and university leaders.

Competitive grants

Competitive funds have proven their strength and value as an effective and flexible resource allocation mechanism for transformative investment purposes. With this mechanism, institutions are generally invited to formulate project proposals that are reviewed and selected by committees of peers according to transparent procedures and criteria. Tanzania could emulate the example of Australia and South Africa, two countries that have been pioneers in using competitive grants in support of equity (Salmi, 2019).

This package of financial measures would not only help female students overcome existing financial barriers but also provide higher education institutions with strong incentives to work together with the government on this crucial task.

3.2.7 Non-Monetary Measures

With respect to non-monetary measures, the Government of Tanzania could intervene in the following manner to orient and support higher education institutions keen on increasing opportunities for access and success of female students in STEM programs, and for improving the gender balance among senior academics and university leaders: (i) reformed admission procedures / quotas; (ii) anti-discrimination laws; (iii) anonymous research grant reviews; and (iv) basic education reform.

Reformed admission procedures / affirmative action programs

The Government of Tanzania needs to put in place the legal framework and set the parameters allowing universities to introduce more flexible admission procedures to encourage female students to enter STEM programs. Facilitating the admission process for girls through positive discrimination and quotas can help promote greater equality of opportunity for female students. A recent study examining the effects of quotas for disadvantaged castes and women at 200 engineering colleges in India found that the affirmative action program had increased college attendance for the targeted students, especially at the prestigious Indian Institutes of Technology (Bagde *et al*, 2016). Contrary to the widely held belief that affirmative action puts beneficiaries into academic programs for which they are not sufficiently prepared, the targeted students assessed in the study achieved similar academic results as the other students. A small number of universities have introduced their own affirmative action program, following the lead of the University of Dar Es Salaam and Sokoine University of Agriculture.

Tanzania has had a long tradition in this area. One of the policy measures taken after the 1974 Musoma declaration was the exemption of young women from the two-year national service, which allowed them to be considered for higher education directly after graduating from secondary school. To increase the pipeline of girls at the secondary education level, the government introduced a quota system to raise the transition rate for girls from primary to secondary schools, with a 50 percent quota applied to the Primary School Leaving Examination. Research revealed that, because of the lack of remedial interventions, the academic performance of girls deteriorated in upper secondary, as societal and cultural expectations for girls tended to have a stronger influence than schooling (Bendera, 1994).

Anti-discrimination legislation

One of the most pressing tasks for MoEST and the TCU should be to assess the existing legislation to confirm that it is sufficient to protect female students and academics from discriminatory behaviors, including sexual harassment and gender-based violence. Equally important is the need to verify that the legal framework is actually implemented society-wide and at all secondary and higher education institutions.

Support of Female Researchers

The Government of Tanzania could also take measures to increase the scientific visibility of female researchers. Studies have shown that evaluating research grant applications anonymously helps increase the probability of success of female academics (Johnon and Kerk, 2020). Male reviewers, who dominate review committees, tend to rate female applicants substantially worse than male applicants.

Basic Education Reform

As an integral part of the policies to promote gender equity in STEM programs at the higher education level, the TCU should work closely with MoEST to ensure that strong measures are taken in primary and secondary education to address the root causes of gender imbalance, especially in science subjects. Training and recruiting well-qualified female science teachers who can introduce innovative curricular and pedagogical approaches to make science subjects more attractive to girls is an important action in that context. These female teachers could, at the same time, serve as role models for female students. Male teachers should also receive sensitization training to avoid the dissemination of traditional beliefs biased against recognizing the potential of girls in science. Socio-cultural norms are significant constraints for girls to pursue STEM and efforts to overcome them are important. Textbooks, classroom dynamics and extra-curricular activities should all contribute to eliminating gender stereotypes and promoting a positive view of the role that girls and women can play in science and technology. The curriculum, in particular, must move away from the traditional approach whereby science teachers "teach physics, chemistry and biology as an abstract corpus of petrified learning with no practical relevance or human interest" (Bendera and Moya, 1998). Efforts must be made to expose girls to scientific knowledge in an engaging way. Textbooks should insist on the positive role that women make to economic and social development. The curriculum, textbooks and assessment methods should be fully aligned as building blocks of an inclusive approach that promotes science education for girls.

Starting as early as possible in the education cycle is important in that regard. According to new evidence from the OECD International Early Learning and Child Well-Being Study (IELS), gender norms are evident in what many five-year-olds say about what they want to be when they grow up, determining imbalanced gender representation in scientific fields later on in schooling, and later on in life. Communities and families should be sensitized to the importance of educating girls, their equal capabilities in STEM, and the opportunities for future employment, income and contributions to society if girls pursue science subjects.

An interesting experiment carried out in Norway sheds light on the importance of female role models in classroom and non-classroom settings in influencing the future career choices of young students.

> Due to its universal healthcare system, beginning in 2001, the government assigned every Norwegian resident a primary care doctor known as a General Practitioner (GP). Researchers investigated whether Norwegian girls who were randomly assigned female GPs between 2002 and 2011—with whom they typically met twice a year—would be more likely to pursue STEMM fields as high school and college students because they had exposure to a female role model in a STEMM field when they were children (Riise *et al*, 2019).[22]

The Government of Tanzania could continue its policy of establishing single sex boarding schools for upper secondary education students in rural areas, which has been found to be highly effective in the past (Swainson, 1998). Several female students and academics interviewed for this Policy Note confirmed that this experience had been a crucial element in their educational success.

Finally, putting in place a strong academic and career guidance system in all high schools is a key component of the reform to encourage more young women, who often lack the information and motivation to pursue their studies, to view science subjects and STEM careers positively. A

22 STEMM programs include Medicine.

career information and guidance system can be defined as a set of tools and services intended to assist individuals to make educational, training, and occupational choices and to manage their careers (Watts and Fretwell, 2004). To operate in an effective manner, the career information and guidance system must be designed and put in place as a coherent system bringing all necessary stakeholders together, including MoEST, TCU, Ministry of Labor, Ministry of Economy, all higher education institutions, Chambers of Commerce, etc. It must rely on sound measurement tools for assessing quality throughout the system, including the quality of the information offered to students and graduates. The system should facilitate information access, allow for self-help and self-development, lead to increased use of information and communication technologies, and promote interaction among higher education institutions, the private sector and NGOs.

3.3 Institutional Level Interventions

A recent policy research report on equity in higher education, commissioned by the Lumina Foundation, revealed a number of good practices at the institutional level (Salmi, 2019). The first one is to have a clear strategy that can be either a stand-alone document or is embedded in the institutional strategic plan. This allows higher education institutions to mobilize their community and stakeholders around common equity objectives and targets. Where such strategies already exist, it would be important to examine the key constraints to their effective implementation. Having an implementation framework and bespoke department responsible for gender equity-related activities under the direct authority of an institutional leader is a second important factor of success. Third, partnerships between higher education institutions and firms can generate additional resources to finance scholarships for students in need of such support. In the Colombian Province of Antioquia, a public-private partnership bringing together the local authorities, a group of private universities and a number of private sector employers offers qualified low-income students who could not find a place in a public university the opportunity to study at one of the local private universities. The students get a scholarship equivalent to 75 percent of the tuition costs and receive a loan from the national student loan agency for the remaining 25 percent.

Experience from several countries points to a special challenge faced by elite public or private universities keen on becoming more inclusive (Salmi, 2019). Beyond ensuring increased access for traditionally under-represented students through outreach and affirmative action programs, it is equally important to provide a welcoming environment for first-generation students who may feel uncomfortable when the institutional culture is heavily influenced by the social norms of a majority of students from affluent families. Even in Australia, which has been a champion of higher education equity, lack of social capital adversely affects the chances of first-generation students to find internships and prepare for employment. It is, therefore, critical to provide appropriate support and a favorable socio-cultural environment at the institutional level. For instance, when Harvard University committed to take the gender imbalance issue seriously in the mid-2000s, it adopted the following seven measures:

- Appointment of strong leaders to deal with the issue of diversity,
- Establishment of a high visibility Office responsible for promoting diversity,
- Dissemination of relevant research results on the importance of diversity and successful policies to improve the situation,
- Constant improvement of recruitment and promotion policies and practices,
- Support for the families of academics,
- Evaluation of the impact of the university's policies, and
- Participation in networks of partner institutions to share good practices and relevant lessons.[23]

23 https://college.harvard.edu/life-at-harvard/diversity-inclusion

Following the experience of leading universities in South Africa, each Tanzanian higher education institution ought to create an Office dedicated to the promotion of diversity, responsible not only for facilitating the recruitment and support of female teachers (retention, promotion, work environment, mentoring, balance of professional and personal life), but also the promotion of diversity within the student body and the elimination of all forms of direct and indirect discrimination against female students. To improve gender balance among their students, Tanzanian universities should consider implementing a comprehensive set of measures that would promote access and success for female students, with a special focus on STEM programs and PhD programs, where the gap is more acute. Measures could be considered in the following areas: (i) outreach and bridge programs, (ii) affirmative action, (iii) retention, (iv) prevention of sexual harassment, (v) specific measures in support of female PhD students and academics, (vi) role-modeling, and (vii) mentoring programs.

3.3.1 Outreach and Bridge Programs

Programs that link universities to primary and secondary schools can be effective in reducing the academic, aspirational, informational, and personal barriers that restrict the access of female students to higher education. It is particularly important to showcase role models illustrating that women can excel in science and engineering programs, which can help to overcome some of the social and cultural norms that prevent women from pursuing STEM disciplines. Several Tanzanian higher education institutions have a regular program of visits to secondary schools in their geographical area to reach out to students there and provide information about career options at the post-secondary level. The State University of Zanzibar (SUZA), for example, has a "5-km project" involving partnerships with secondary schools within a 5-km radius, with the purpose of providing academic and career counseling to students and training opportunities for school teachers on innovative teaching methods. Following the example of the University of Dar Es Salam, which introduced a pre-entry program back in 2003, several universities have put in place remedial programs to help female high school graduates reduce possible academic gaps in science subjects. Unfortunately, University of Dar es Salaam has since eliminated this program. In other countries, universities organize summer camps for high school students, to make them aware of all the opportunities that STEM careers can offer, with a special focus on attracting female students. This is a measure that Tanzanian universities could easily implement.

3.3.2 Affirmative Action

The University of Dar Es Salam has been a pioneer in establishing a positive discrimination program to attract more female students, especially in its STEM programs like engineering education. Following the 1974 Musoma declaration by the ruling party, University of Dar es Salaam started allowing female high school graduates to enter the University automatically. In 1997-98, a new affirmative action policy was put in place. The entry cut-off point for female students was lowered by 1.5 points and the University provided them with remedial classes to boost their performance in science and mathematics. Full scholarships were also available for the beneficiaries of the program. Evaluations of the program have found that female students admitted through this program had equal or higher results than their male peers. However, the lack of funding to sponsor more female students has been one of the major limitations to expand the program (Kilango *et al.*, 2017).

3.3.3 Measures to Increase Persistence and Retention

Improved access for female students is not the only driver of progress. It is equally important to focus on student success and degree completion, which requires support programs and regular measurement of outcomes such as graduation rates for female students. To promote student

persistence, universities must put in place dedicated support mechanisms, financial, academic, and psychological, in order to increase completion rates. Adequate financial aid in the form of scholarships that cover all expenditures for female students is a key component of retention policies, especially in STEM programs.

3.3.4 Policies to Prevent Sexual Harassment and Sexual Violence

It is important to define and enforce strict policies against all forms of sexual harassment and corruption involving sexual favors. A 2017 survey found that 21 percent of women working in Tanzania had experienced sexual harassment at their workplace (Vuckovic *et al.*, 2017). Many Tanzanian universities, following the example of the University of Dar Es Salam, have guidelines to deal with sexual harassment. However, interviews conducted for this Policy Note suggested that effective implementation of the existing policies and guidelines is weak due to inadequate mechanisms to address gender-based violence, incomplete understanding among students and staff of what gender-based violence constitutes, and limited accountability measures. Universities should assess the obstacles to the successful implementation of its sexual harassment policies and guidelines. Subsequently, it would be important to identify actions to address the key bottlenecks, clearly assign roles and responsibilities to ensure accountability, and monitor and evaluate, through regular surveys, whether female students are satisfied with the helpfulness of the guidelines and the University's punitive and corrective actions when cases are reported.

Universities also need to put in place special counseling programs, sensitization workshops, and victim care centers. All members of the academic community must be fully aware of the regulations, and university leadership must make it clear that victims will be protected, and perpetrators punished severely. Additional measures to improve the safety of female students include street lighting on the campus, giving priority to women to benefit from on-campus dormitories, ensuring well-maintained dormitory facilities for women, and setting up a gender desk, as some Tanzanian universities, especially private universities, have already done. Given the more favorable distribution of enrollment by gender at private universities, there is scope for knowledge sharing in this area between public and private universities and possible adoption of successful approaches by public institutions as well.

3.3.5 Gender Balance among PhD Students

International experience indicates that scholarships are a powerful tool to increase opportunities for qualified female students, not only by eliminating the financial barriers that prevent many of them from enrolling in the first place, but also by providing adequate support to boost the female students' chances of succeeding in their PhD program.

3.3.6 Gender Balance among Senior Academics

Each university needs to define and implement clear employment and promotion policies that, while respecting meritocratic principles, effectively promote the advancement of qualified female academics. This may include special provisions to support female academics pursuing a PhD through financial incentives and scheduling modalities adapted to the family life of academics with young children. This aspect is especially important in the context of the current pandemic, which has affected female academics more adversely than their male colleagues (Salmi, 2020). McKinsey research has shown that building a critical mass of female professionals within an organization is likely to reduce the feelings of isolation that many women feel as they fill positions typically occupied

by men.[24] Box 1 shows how McGill University in Montreal, Canada, has sought to promote a greater participation of academics from under-represented groups, while Box 2 relates the experience of the Consultative Group on International Agricultural Research (CGIAR) to improve gender balance among its researchers.

Box 1 – Advancing Academics from Under-Represented Groups

The following principles illustrate how McGill University in the Canadian province of Quebec defined its employment policy with respect to the advancement of academics from under-represented groups.

"McGill University is committed to:

- Fulfilling its mission within an institutional environment that embraces diversity.
- Respecting the equal dignity and worth of all who participate in the life, work and mission of the University.
- Developing policies, programs, practices and traditions that facilitate the full participation and advancement of members of historically disadvantaged groups in Canada (indigenous peoples, visible minorities, ethnic minorities whose mother tongue is neither English nor French, persons with disabilities, women, and persons of minority sexual orientations and gender identities) (hereafter, "designated groups") by eliminating direct, indirect and systemic discrimination.
- Recruiting and retaining academic, administrative and support staff on the basis of individual merit and achievement, while ensuring that all persons and, in particular, members of designated groups, will have genuine, open and unhindered access to employment opportunities free from artificial barriers.
- Achieving equality in the workplace so that no member of a designated group is denied employment opportunities or benefits for reasons unrelated to ability by giving effect to the principle that employment equity means more than treating persons in the same way but also requires special measures and the accommodation of differences."

Source: https://mcgill.ca/secretariat/files/secretariat/employment-equity-policy.pdf

24 https://www.mckinsey.com/featured-insights/gender-equality/one-is-the-loneliest-number

Box 2 – Improving Gender Balance at the CGIAR

The Consultative Group on International Agricultural Research (CGIAR) established its Gender and Diversity programme in 1999 with a mandate to promote the recruitment, advancement and retention of women scientists and other professionals. A Gender Monitoring Framework was designed for the CGIAR in 2013 to monitor progress in addressing what CGIAR has done in its own workplace(s) to raise the share of women in senior positions and those seeking out CGIAR as an employer of choice; and progress in gender mainstreaming achieved throughout the CGIAR system, using such indicators as the number of male and female staff in key leadership positions, the integration of gender considerations into research priority-setting, implementation and evaluation and, lastly, the extent to which research budgets and expenditure are allocated with respect to gender.

In 2014, women made up 31 percent of the CGIAR leadership. The CGIAR Consortium has since hired a Senior Advisor on Gender and Research to advise centres on related issues in the workplace. Reports are also submitted to the CGIAR Fund Council every six months to monitor the performance of the Gender and Diversity programme.

Source: CGIAR, 2015

3.3.7 Role Modeling

Positive role models may be an effective avenue for increasing female representation in STEM programs. A recent study has shown, for example, that female students are more likely to pursue a STEM field if their introductory class in that discipline was taught by a female academic, emphasizing the need for more female academics (Riise *et al*, 2019). Tanzanian schools and institutions could also consider organizing regular interactions or a "speaker series" with women in STEM fields to inspire young female students to enroll and continue in science and technology programs. A program in France found that one-hour sessions with female role models in STEM-related careers speaking about their experience in the field increased the likelihood of a Grade 12 girl enrolling in a higher education STEM program by 20 to 30 percent (Breda *et al*, 2020). A similar program exposing young pre-adolescent girls to female leaders from STEM companies is organized by the Inspiring Girls Foundation and has shown the positive impact of role models on girls' interest in STEM and reduction in gender stereotypes (Gonzalez-Perez et al, 2020).[25] At the college level, exposure to female STEM role models followed by a written reflection by female students on the similarities they share with the role model have also been shown to diminish the effect of negative stereotypes about women's STEM capabilities (Van Camp *et al*, 2019). In a historical perspective, Marie Curie's life represents the ultimate role model story. Not only was she the first female scientist to win a Nobel Prize in 1903, but she is also the only female scientist to ever win the Nobel Prize twice (physics and chemistry). Her daughter also won the Nobel Prize (chemistry).

3.3.8 Mentoring

In a challenging career path where females are a minority, women can benefit greatly from a friendly and effective support system (African Academy of Science, 2020). Studies have found that mentoring

25 For more information on the program, please see: https://inspiring-girls.com/

young female professors increases their probability of having top-tier publications and research grants. Structured mentoring programs, implemented through individual counseling and workshops, can provide career-building scientific skills, such as preparing successful grant applications, developing leadership and ethics, improving research quality, and acquiring project management skills. Generally, the evaluation of mentorship programs has shown that they help women establish networks and grow professionally. Such networks and mentoring systems can provide a sense of professional community to females in male-dominated fields. A good example in that respect is the Peer Counselling program put in place by Kilimanjaro Christian Medical University College, a constituent college of Tumaini University Makumira in Moshi, which represents an innovative experience that other Tanzanian universities could emulate. **Box 3** shares lessons from successful experiences in Cameroon and Belgium.

Another innovative program, called “One Day Experience” is worth mentioning in this context. The Barcelona-based company helps 15- to 24-year-olds with career counseling.[26] It connects young adults who are not yet ready to choose a career and professionals who can give them a sense of what working in their industry would be like. The platform connects the indecisive young people with professionals in their fields of interest and gives them the opportunity of shadowing these mentors on the job for a day. The company provides “vouchers” that young adults use to cash in for one day on the job with experts in industries that they are interested in knowing better.

3.3.9 Measures During the Pandemic

Finally, higher education institutions all over the world have tried to put in place measures to support female academics who have been adversely affected more than their male colleagues by the pandemic in many country contexts. These measures have included provisions to help female faculty achieve tenure: automatic one-year extension without prejudice, and removal of excessively negative student evaluations during the pandemic. Some universities have also addressed ways of avoiding short-term academic losses for female academics, such as surveys to identify obstacles faced by female academics, funding for childcare, waivers of non-essential administrative duties, teaching relief for academics with the heaviest care-giving obligations, and online support networks for family issues.

26 http://onedayexperience.es/

Box 3 – Supporting Early-Career Women Scientists in Cameroon and Belgium

Cameroon. Early-career women scientists in Cameroon face numerous challenges in establishing their careers, including a lack of mentors and role models, a lack of research and proposal development skills, inadequate capacity for fundraising and a lack of networking opportunities.

To address these challenges, women health researchers came together in 2015 to form the Higher Institute for Growth in Health Research for Women (HIGHER Women). The Cameroon-based consortium is designed to provide the country's early-career women scientists with the mentoring, skills development and career planning they need to establish an enduring presence in the field of health research.

HIGHER Women provided professional support, mentoring and networking opportunities to a cadre of young women scientists to enable them to undertake health research and contribute to addressing infectious diseases in Cameroon. A mentor-protégé programme partnered 17 mentors, representing 18 research institutions and universities across Cameroon, with 52 protégés with less than 5 years of experience. Pairs were tailored to the protégés' needs and professional interests. A 5-day workshop provided training in grant writing, proposal development and research fundamentals, including study design, research ethics and intellectual property. In addition, the workshop served as an important venue to facilitate and promote networking among the early-career and established women scientists.

Initially comprising just a few individuals, the consortium received a great deal of attention in the media, prompting other established women scientists working in academia, research institutes and government institutions to join their ranks. The original 50 protégés are expected to transition to researcher within 5 years, and to "pay it forward" by becoming mentors to future early career women scientists. HIGHER Women has established a website to facilitate networking, information sharing and advocacy for women researchers.

With support from several ministries, including the Ministry of Higher Education, the Ministry of Women's Empowerment and the Family and the Ministry of Scientific Research and Innovation, HIGHER Women is being formalized and launched as a national network with country-wide membership, and a platform to bring together women scientists.

Belgium. In October 2009, Ghent University in Belgium started a mentoring program for young female researchers. The mentors were male and female professors, and the mentees were female researchers with a PhD. As part of the program, they met several times to talk about topics of the mentee's choice. The coordinators also organized workshops about networking, work/life balance and career planning. The first mentoring year ended in September 2010 and the mentees were very positive about the impact of the program on their career. Some of them were just happy to have been able to talk about their uncertainties, while others made real career changes. In addition, male mentors said they had learned a lot about how women experience the difficulties of an academic career.

Source: https://www.who.int/tdr/capacity/gender/higher-women-cameroon/en/; OECD Higher Education Program, 2014.

4. Conclusion

Women in time to come will do much.

Mary Ward (16th century)[27]

It is clear that disparities in primary and secondary education shape the size and characteristics of the pool of female students reaching post-secondary education. However, improving gender equity in higher education is indispensable to reach the education-related Sustainable Development Goals (SDGs), notably SDG 4 and Target 4.3 ("ensure equal access for all women and men to affordable quality technical, vocational and tertiary education, including university"). Against this background, the Government of Tanzania is fully committed to the equity agenda throughout the education system.

Available information shows that, in spite of significant progress achieved in the past two decades by the Tanzanian authorities, access of female students to STEM programs remains limited, translating in a substantial loss of talent for the country and unequal opportunities for girls and women. The pipeline of academically prepared and motivated female high school graduates is small, and the proportion of female students actually enrolling in STEM programs is notably insufficient. An even smaller share of female academics is able to reach the most senior academic and leadership positions in higher education institutions.

The first step towards the formulation of a comprehensive policy would be to acknowledge officially that gender discrimination in the education system is still a serious issue, and that greater efforts should be made to overcome the barriers that prevent female students and academics from benefiting from the same opportunities as their male colleagues, especially in STEM programs.

The second step is to accelerate progress in implementing the range of measures outlined in this Policy Note at the national and the institutional level. This requires a combination of financial and non-monetary measures to remove the cultural, social and economic obstacles affecting the access and success of females in STEM programs. It also calls for full alignment between the political commitment towards gender equity and the resources made available to support all the worthwhile initiatives under way.

The third step is to monitor and evaluate the implementation of the policy and interventions regularly to identify and address issues and bottlenecks in a timely manner and take corrective actions.

Table 4 presents a summary matrix of the various instruments that Tanzania can use to promote gender equity in higher education generally, and in STEM programs specifically, at the national and institutional levels.

27 Mary Ward (1585-1645) was an English nun who founded schools throughout 16th century Europe.

Table 4 – Instruments for Gender Equity Policy in Tanzania

Policy Goal / Instruments	STEM Programs	PhD Programs	Senior Academics	University Leaders
National Policies				
Tuition exemption	✓	✓		
Scholarships / Loans	✓	✓		
Funding Formula	✓	✓	✓	
Performance Agreements	✓	✓	✓	✓
Competitive Grants	✓	✓		
Quotas / Affirmative Action	✓	✓	✓	✓
Anti-Discrimination Laws	✓	✓	✓	✓
Anonymous Research Proposals			✓	
Basic Education Reform	✓			
Institutional Policies				
Tuition Exemption	✓	✓		
Scholarships/Loans	✓	✓		
Outreach/Bridges	✓			
Affirmative Action	✓	✓	✓	✓
Support for Retention	✓	✓		
Sanctions for Sexual Harassment	✓	✓	✓	
Mentorships	✓	✓	✓	✓
Support for Female Academics			✓	

Table 5 – Sequencing of Priority Interventions for Promoting Gender Equality in STEM Higher Education

Time Horizon	Priority Interventions	Responsible Institution
Short Term	Prepare a national gender equity strategy for higher education and identify long-term goals and medium-term targets with clear and measurable indicators	MoEST
	Prepare/strengthen gender equity strategy at the institutional level with clear goals and targets, especially for STEM, at the student and academic staff level	Higher education institutions
	Identify/set-up specific department or unit for gender equity related activities under the direct authority of an institutional leader and develop implementation plan for gender equity strategy	Higher education institutions
	Assess legal framework and institutional policies to protect students and academics from discriminatory behaviors, including sexual harassment and gender-based violence	MoEST, higher education institutions
Medium-Long Term	Introduce/strengthen career information and guidance system in high schools to increase awareness of STEM programs and career options	MoEST, higher education institutions
	Introduce affirmative action programs to encourage female students to enroll in STEM programs	MoEST, higher education institutions
	Provide scholarships for female students, especially at the PhD level, for STEM programs	MoEST, higher education institutions
	Develop mentorship programs to support female students and academics to grow professionally, strengthen networks, and develop leadership skills	Higher education institutions
	Reform the legal framework and institutional policies on the basis of the findings of the assessment (indicated as short-term policy)	MoEST, Higher education institutions
	Coordinate with the basic education sub-sector to address constraints to girls' achievement and interest in science and mathematics in primary and secondary school	MoEST

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