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Increasing Women's Participation in Science, Mathematics and Technology Education and Employment in Africa

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INTRODUCTION

Education statistics in Sub-Saharan African (SSA) countries show that women continue to lag behind men in education in general and specifically in science, mathematics and technology (SMT) education. Also, education stereotyping continues, with women and girls tending to study programmes related to so-called "women's" occupations such as nursing, secretarial jobs and social work. Programmes in engineering, physics and the so-called "hard sciences" continue to be dominated by men and boys.

When formal education (in terms of schools) was introduced in SSA by the religious missionaries and colonial powers, girls were not allowed to go to school until much later. In Rwanda for example, girls were allowed to go to school 34 years after boys were. Even then, their school life was very much limited compared to that of boys (Allison *et al*, 2008).

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* The views expressed in this paper are those of the author and do not necessarily represent those of the United Nations.

The purpose of education during the colonial period aimed at creating citizenry that would support the needs of the colonial masters. However, after gaining political independence, the purpose for having educated citizens changed; development of the newly independent countries was central to the investment in educating the population. For example in the early 1960's, Julius Nyerere (first president of the United Republic of Tanzania) articulated the purpose of education as follows:

> *"Education is viewed as an instrument for preparing the community for life. It must foster the social goals and encourage the growth of the social attitudes and values. These include equality and respect …. Education must encourage the development of an enquiring mind, a scientific outlook at issues; creativeness, problem solving, the ability to think for one self, to interpret decisions, to learn from others and reject or adopt it in accordance with particular needs and circumstances. Education … must impart knowledge and skills needed for family life and for participation in the development and maintenance of the community"* (Nyerere, 1968: 274)

Even today, education continues to be central to a country's well-being and economic development. When a country educates its citizens (women as well as men), economic productivity rises, maternal and infant mortality rates fall, fertility rates decline, and the health and educational prospects of the next generation are improved (Lopez-Claros *et al*, 2007).

Education raises awareness "to be engaged as *thoughtful citizen* and to become meaningfully involved in the change process as co-responsible thinkers, actors and leaders" (Mbilinyi, 2000). Apart from being more than half of the world's population, since women have a huge influence on the well-being of their families and societies, the effect of women's education on population growth, economic growth and poverty is enormous.

The culture of marginalisation and discrimination of the women folk in education has persisted to this day. For example, in the past (pre and post independence), in many SSA countries, fewer places were available for girls and women in schools and universities. Although currently as many women and girls as men and boys can be admitted in a school/ university, still fewer women get selected to join the public schools and universities. Analysis of examination results and selection of students to join public secondary schools and tertiary level institutions from 10 countries showed that for every 100 boys who passed the secondary school examination and were eligible, 15 got a chance to go to a public university while for every 100 girls who passed the examination and were eligible only 7 got a chance.

The stereotyping of knowledge and skills given to girls and boys at the introduction of formal schooling combined with marginalisation and discrimination against women continues to influence the gendered nature of education even today and hence determines the occupation of men and women.

GENDER EQUALITY INITIATIVES IN SUB-SAHARAN AFRICA

Collective efforts of nations to address the situation of gender inequalities in education and occupations have been undertaken as far back as the 1940's both at global and at country level.

For example in 1946, the United Nations established the Commission on the Status of Women (UN-CSW) which is dedicated solely to gender equality and advancement of women in the UN member states.

Many SSA countries started commitments to address the gender gap in education and employment immediately after independence. Most efforts are dedicated to increasing the number of women in decision-making positions on the political front and increasing girls' access to primary and lower secondary education. SMT education and women's education are seen to be driving forces for attainment of development goals by many nations.

For example, Rwanda has attained gender parity at the level of parliament and is atop all nations by having the highest proportion (56%) of women legislators. SSA has an 18.7% share of women in parliament, second to Europe (with Nordic countries included) where 21.4% of women are parliamentarians. The Southern African Development Community (SADC) countries have pledged to attain 50% of women representation in parliament. The United Republic of Tanzania with 30.7% of women representation has committed to 50% in the next elections to take place in October this year. Driven by the Education for All (EFA) targets, the third Millennium Development Goal (MDG3) and poverty reduction strategies, many SSA governments in collaboration with development partners, the Forum for Africa Women Educationalists (FAWE), local and international non-governmental organizations (NGOs) and civil society are implementing various strategies to ensure gender equality in education. The African Union (AU) has put in place mechanisms and special ministerial level groups that are responsible for monitoring progress towards attainment of EFA and MDG3. Through the poverty reduction strategies, many SSA countries have attained gender parity in primary and lower secondary schools while gender parity in upper secondary and public tertiary education is still a challenge. For example, Rwanda has reached parity in primary education (95.8% for girls and 94.7% for boys) and in private universities (52.7% for women and 47.3% for men). However, the gender gap in SMT education at all levels, and thus in occupations, continues to be very wide in SSA. At primary and lower secondary level, the gender gap is in performance as all boys and girls take mostly the same subjects. Girls perform poorer than boys in SMT subjects.

The primary education SMT curricula seek to establish high quality SMT and education for all. In most SSA countries, to date, primary school is a completion stage for more than 50% of graduates. Throughout the SSA region all students in primary schools study the same disciplines. Primary level SMT education should be sufficient to enable graduates of this level to master their surroundings and improve their lives. A human being should understand what surrounds her/ him and how to interact with these for sustainable development. A human being is surrounded by the geosphere (soils, sediments and rocks that make up the solid part of the earth); the hydrosphere (liquid and solid water standing and flowing over and through the geosphere); the atmosphere (gases and aerosols - it extends from the earth's surface to the edge of the space) and the biosphere (made up of all organisms). Primary level SMT education should aim at covering the basic aspects of life issues, i.e. issues about human beings and their surroundings. This should form a common knowledge to any human being, man or woman.

Analysis of primary school SMT syllabuses from SADC member countries shows that most of them contain topics of agriculture, biology (of plants, animals and micro-organisms), energy, work, machines, environmental conservation and ecosystems, and health education. For example, health education topics are taught from the first year all through to the last year of primary education, which is either six or seven years of schooling. Health topics taught in primary school include hygiene (body, oral and environment), the human body (parts, organs and systems), reproductive health and family life health (this includes maternal health and child health); nutrition and food types; diseases (infectious, spread, prevention and symptoms); HIV/AIDS and other topics such as living healthy, physical exercises, first aid, road safety, social services, and knowledge of health centres/ hospitals. SMT education arouses curiosity and provokes questioning. If primary SMT education is properly carried out and therefore effective, it is the most potent force there can be for development. However, studies such as those conducted in 12 SSA countries by the Female Education in Mathematics and Science in Africa (FEMSA) in 1996-2001, revealed that in most science topics generally the everyday experiences are missing for both boys and girls (FEMSA, 1999).

Pupils are considered to have completed their education by doing and passing examinations. The FEMSA project assessed science and mathematics examinations for primary and lower secondary education in the 12 SSA countries. It was observed that to a large extent, the examinations assessed pupil's ability to learn facts and present them on demand within a specified time period. To a very small extent, the exams assessed pupil's power to reason. No examinations or other forms of assessment were available to assess transfer of knowledge and skills to ordinary life (*ibid*).

Some vocational skills are offered at this level as well. Topics include home economics, sewing, cooking, handicrafts, plumbing, carpentry, making repairs (radios, bicycles, clocks), and recycling garbage into usable handicrafts or manure. The teaching of most topics (science and vocation) is done theoretically as an information package by teachers mostly with limited knowledge and exposure on many of the topics. In vocational topics, gender stereotyping is rampant with girls taking domestic sciences and boys taking plumbing, carpentry and the like.

Access to formal schooling and the primary completion rate (PCR) are still compromised by completion and the quality of the education given in SSA. Reports (e.g. UNESCO) show that in half of the SSA countries, of each group of students that enters primary school, less than 60% reach the last grade, with more girls than boys dropping out. This rate ranges from 22% to as high as 98%. Studies such as those conducted by the Southern Africa Consortium for Monitoring Educational Quality (SACMEQ), the Programme for the Analysis of Education Systems of the Conference of Education Ministers of Francophone Countries (PASEC) and the Monitoring Learning Achievement (MLA) project have established that the quality of education in Africa is low; reading levels and language mastery are generally very low. MLA, for example, established that in the fourth year of school, minimum levels of reading, arithmetic and life skills are far from being achieved in many countries. Even among those who reach the last grade of primary school, many possess weak numeric and literacy skills. The Trends in International Mathematics and Science Study (TIMSS) and SACMEC studies showed that between 68% and 90% of students in eighth grade failed to reach the low benchmark in mathematics. FEMSA studies established that girls fell behind boys by a wide margin (*ibid*).

As of 2003, many African countries have launched plans to increase access to secondary schooling and to address education quality and gender equality issues. The Association for the Development of Education in Africa (ADEA) is working on the understanding of what makes an effective school and best strategies that can be implemented in Africa. Early childhood education, adult education and higher education continue to be marginalised. From the Education for All Global Monitoring reports 2005 and 2006 (UNESCO), SSA has the largest proportion of illiteracy, with 50% of its adults being illiterate and 10 – 15 million school age children not in school in 2006, with more women illiterate and more girls out of school. Gender disparity in literacy rates is reported to have risen from 45% in 1970 to 75% in 2005. The ratio ranges from 20% in some countries to 90% in others. Out of 40 countries whose data were available in 2005 (EFA Reports 2005, 2006), only three had reached gender parity in literacy rates.

Most SSA countries are now implementing education for all in primary and secondary education. They believe that when women have equal access to education and go on to participate fully in business and economic decision making they are a key driving force against poverty. The major issue is the inability of the system to meet costs of education expansion and quality improvement especially in science and technology. Many SSA countries spend a relatively large proportion of their annual budget on education and the education expenditure as a proportion of gross national income (GNI) is also large. However a large part of this is a salary bill (sometimes up to 80%), and little is left to support expensive subjects like those of science and technology. Even at household level, it is estimated that over 60% of family cash income is spent on school fees, uniforms and exercise books. Under such environment, girls are more likely to miss out on the SMT education than boys.

According to the New Partnership for Africa's Development (NEPAD), SMT education in Africa is confronted by challenges of participation, equity, exclusion, quality and relevance, resources and expertise. NEPAD and sub-regional groupings such as SADC have created policies, plans and even units that are dealing with development of systems and networks that will deliver affordable, quality, equitable and relevant SMT education in sufficient numbers. Many African States have developed national policies on SMT education. Common issues in these policies include demystifying science and technology, encouraging the enhancement of targeted funding to the sector, promoting female SMT education, building science and technology institutional and human capacity, protecting and promoting indigenous knowledge systems.

Despite the enabling policy environment and many initiatives that are being implemented to promote women’s education in SMT disciplines, a number of social-cultural and institutional barriers continue to prevent girls and young women from attending schools and universities and from performing equally to their male classmates. Generally, female students continue to lag behind in educational achievement and access, especially in secondary and tertiary levels, where girls’ enrolment, completion and achievement rates are lower.

If we take the case of Rwanda, the state’s development agenda has prioritised science and technology within the educational and development policies. At the same time, Rwanda believes gender equality of the country may act to further exclude female students unless additional actions are taken to promote women’s participation in these fields. Addressing gender equality in the education system, with a focus on improving girls’ educational performance and outcomes, is crucial to meeting Rwanda's development goals and to protecting women's human rights within the country.

Although Rwanda has registered great achievement in gender parity on the political front, girls are still under-represented in government schools, and are instead in private universities which are more expensive, of lower quality and with few or no science and technology programmes. Girls' participation in public higher education institutions (HEI) ranges between 25% and 27% in Rwanda. Participation in SMT subjects at secondary school level ranges between 5% in technical subjects to 40% in biological and chemistry subjects while in overall SMT subject, girls account for 35%. Even in planning and projections, the targets to increase the number of women in SMT are generally very modest. For example Rwanda planned to promote women's SMT education as part of the country's vision to create a knowledge-based society. The set indicators are given in Table 1 below:

Table 1: Programme Support of the Education Sector Strategic Plan, 2006 - 2010

Indicator	2004 Baseline Level	2008	2010
% girls enrolled in mathematics in secondary school	22	26	33
% girls enrolled in chemistry in secondary school	35	40	45
% girls enrolled in 1st year at tertiary level	20	25	30

Source: African Development Fund, Appraisal Report, 2006

INITIATIVES BY HIGHER EDUCATION INSTITUTIONS

Education bodies, especially the HEI, are also undertaking various initiatives to promote women's access, retention and completion of higher education in general and in SMT disciplines. At the level of HEI, the initiatives are both at individual institutional level and at regional networks level such as the Association of Africa Universities (AAU), the Inter-University Council for East Africa (IUCEA), the Africa Network of Science and Technology Institutions (ANSTI) among many others.

Although some of these efforts were already initiated in the 1970s, renewed focus on gender equality in HEI was intensified in the 1990s. These efforts have resulted in gender policies at country level and at HEI level, special policies and programmes focusing on girls and women education, policies focusing on specific gender-related issues such as gender-based violence, re-admission of girls and women students who drop-out due to pregnancy and so on with the aim to create a gender-friendly environment for both men and women. However, women continue to lag behind men in higher education and particularly in SMT education.

Based on the Global EFA Monitoring Report of 2006 (UNESCO, 2005), tertiary education in Africa grew strongly in the period 1990/91 to 2002/03 as a result of policies of privatisation of higher education. The growth rate in the number of students per 100,000 inhabitants between 1990/91 and 2002/03 accelerated with the exception of three countries (Madagascar (-36%), Congo (-14%) and Zimbabwe (-1%)). Other countries registered an average increase in growth of 104% ranging between 18% and 970%. The growth, rates are, however, still very low when compared to other regions. Although the average tertiary level median gross enrolment ratio

(GER) for Africa rose from 2.3% to 2.5% over the period 1998/99 to 2002/03, it was still quite low. The world average for 2003 was 26.7% while that of Africa was 2.5%. While the world's gender gap in tertiary education was narrowing, that of Africa was widening. Although the world gender parity indicator (GPI) rose from 1.07 in 1998/99 to 1.28 in 2002/03, that of Africa dropped from 0.84 in 1997/98 to 0.46 in 2002/03.

At continental level, there exist numerous networks (including electronic ones) that are working towards effecting excellence in tertiary level SMT education and availability of e-learning resources. Many efforts are being undertaken at continental level (e.g. by ADEA, AAU, and ANSTI, NEPAD and AU) to promote SMT education as a vehicle to achieving the MDGs including MDG3. Since the late 1980s, numerous initiatives have been undertaken by African universities to promote an increase in women's access to and participation in higher education and in particular in science and technology professions. The initiatives continue to be undertaken at different levels from the level of individual universities, regional groupings such as the Inter University Council for East Africa (IUCEA) to the continental level such as AAU. Initiatives include enacting policies, regulations and implementing strategic plans that aim at bridging the gender imbalance from the systemic point of view as well as implementing projects and programmes targeting a specific gender equity initiative.

These initiatives have clearly contributed to an increased awareness amongst female secondary school pupils, and interest and capability to cope or excel in science and technology. In Rwanda for example, these efforts have resulted in the increase of women enrolled in universities from 1,283 in 1997 to 15,465 in 2006.

A survey of 1,345 women university graduates of science and technology programmes in Nigeria, (Aderemi, 2009), shows a drastic increase in the number of females graduating in SMT discipline over the years with 70% of the respondents graduating between 1990 and 2000 as seen in Table 2.

Table 2: % women graduates in tertiary SMT among the surveyed 1,345 Nigerian women 2009

Years	1980 and before	1981 - 1990	1991 - 2000
% female who graduated in SMT in the period	5%	25%	70%

Table 3 shows the 2009 situation in a selection of HEI, members of the IUCEA. The concerned universities and colleges are: Kenya (Daystar University , Jomo Kenyatta University of Agriculture and Technology, Kabarak University, Maseno University, Masinde Muliro University, Scott Theological College, St Paul's University, University of Eastern Africa Baraton, University of Nairobi, United States International University); the United Republic of Tanzania (Dar es Salaam University College of Education, Mkwawa University College of Education, Moshi University College of Co-operative and Business Studies, Muhimbili University of Health and Applied Sciences, Muslim University of Morogoro, Ruaha University College, Sokoine University of Agriculture, St Augustine University of Tanzania, St.John University of Tanzania, The State University of Zanzibar, University of Dar es salaam); Uganda (Busitema University, Gulu University, Lugazi University, Makerere University Business

School, Mbarara University of Science and Technology, Nkumba University) and Rwanda (The National University of Rwanda).

Although gender equality in the higher education sector has seen some improvements in students' enrolment, the average female enrolment continues to revolve around 30% of total students except for humanities and social sciences, disciplines where gender parity is observed. Moreover, stereotypes continue to manifest themselves. For example, nursing and social work programmes tend to have large proportions of women, even up to 95% while physics, mathematics and engineering programmes have low proportions of women, below 10%. It should be noted that selection to public HEI is not done by the HEIs themselves. Although the average for Uganda shows 51% of women, the majority of those women are in certificate and diploma programmes offering secretarial and social work education.

Table 3: Status of gender equality in student enrolment in selected HEI in IUCEA

HEI members of IUCEA	Total Students	Female Proportion of Total students	Female proportion of Science and Technology Students
10 Universities and Colleges in Kenya	77,921	41%	17%
11 Universities and Colleges in Tanzania	38,683	39%	24%
7 Universities and Colleges in Uganda	21,467	51%	18%
National University in Rwanda (NUR)	12,796	29%	27%

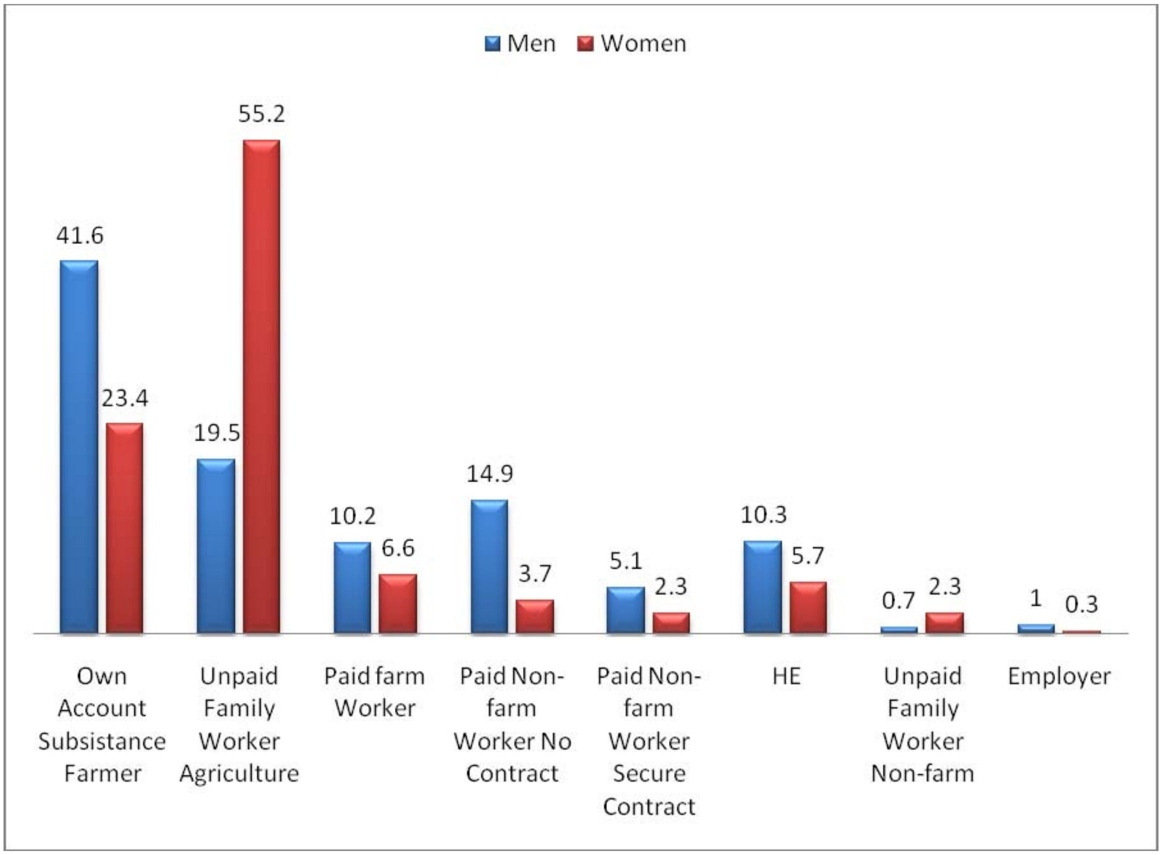
Source: Extracted from IUCEA 2009 Year Book and Facts and Figures of NUR

WHAT HAPPENS AFTER GRADUATION?

However, as girls and women are being encouraged to take-up SMT education, the question - what happens after these girls have been trained and have graduated - has not been adequately addressed. Women are grossly under-represented in Governments, political parties, employment in general and in science and technology specifically.

Figure 1 shows the distribution of main occupation by men and women in Rwanda from the 2006 household survey. We see that 57.5% women are in unpaid work while only 20.2% men are engaged in unpaid work. The majority of women (55.2%) are in agriculture as unpaid family worker, while the majority of men (41.6 %) are also in agriculture but as own account subsistence farmers. Women account for 18.3% of paid jobs while men account for 40.5% of these. As for occupation in higher education, men's proportion is 10.3% and that of women is 5.7%.

Figure 1: Main Occupation of Men and Women - Integrated Household Survey 2006, Rwanda



The survey of the 1,345 women graduates of SMT disciplines (Aderemi, 2009) established the areas of employment to be (i) research and development (44%) which includes quality control, (ii) administration (37.5%) (iii) academics (9.4%), (iv) manufacturing and production (4.9%), (v) finance (3.4%), (iv) medical (0.5%) and (vii) security/solicitors (0.1%). The majority (53%) of respondents were married, and they indicated that their mobility was restricted by or linked to their spouses'. Further it was established that only 30% of these women were employed in science and technology departments. Those in non-science and technology departments were distributed in administration (43.3%), finance (33.4%) and public relations (22%) and others (1.4%), such as library. Reasons given for not being in science and technology departments included not having an alternative because of limited mobility (40%), wanting a change in career (20%), and finding a career in science and technology too demanding with poor pay leading some women to abandon science and technology for greener pastures or more attractive opportunities (20%). Only a small proportion (0.2%) changed jobs on other domestic grounds. The majority of respondents said they knew more than 10 women colleagues, who were graduates in science and technology, but worked in non-science and technology departments.

Table 4 gives the 2010 status of staff in the selected HEI members of the IUCEA. We see that the proportion of women academics is very low. Generally much effort is invested in increasing numbers, while the underlying factors resulting in low participation of women are not critically considered.

Table 4: Status of gender equality in staff numbers in selected HEI in IUCEA

HEI member of IUCEA	Total Staff	Female proportion of total staff	Female proportion of academic Staff	Female proportion of academic science and technology staff
10 Universities and Colleges in Kenya	5,766	32%	11%	3%
11 Universities and Colleges in Tanzania	5,047	33%	16%	7%
7 Universities and Colleges in Uganda	1,787	37%	17%	5%
National University in Rwanda (NUR)	985	31%	21%	2%

Source: Extracted from IUCEA 2009 Year Book and Facts and Figures of NUR

In the employment arena, especially in science and technology enterprises, it is widely assumed that women are less capable, less competitive, or less productive than men and that these characteristics account for the scarcity of women in higher ranks. While the question of gender difference in scholarly productivity is complex, the evidence suggests that women are as capable and as productive as men in the academic arena. I conducted a simple survey in 2001 of former heads of departments (HoD) and deans of faculties at the main campus of the University of Dar es Salaam (UD) for the 1994 – 1997 and 1997 – 2000 triennia and established that all HoD who were removed from their positions because of incompetence were men. Deans and HoD who attracted huge funds and constructed buildings were all women. All women deans and HoD made significant changes in their units and all deans or HoD who were involved in a scandal were men. Although this was not a research, it indicates that women are not incapable in academic leadership. I conducted a survey of highly productive scholars of both sexes at UD and found that differences did exist in the type of publication but not in the quality or quantity of work.

Resistance to recognise women's competencies persists regardless of available evidence. For example, there are women among the few scientists who have won highly recognisable international awards in East Africa. Professor Adelaide Semesi of UD in the United Republic of Tanzania won the prestigious Pew award in Conservation and Environment. In 2009, Professor Anna Kajumulo Tibaijuka (for the United Republic of Tanzania, former staff of UD) won the Goteborg award (also known as the Nobel Environment award).

On the international political front, women have brought fame to the United Republic of Tanzania more than men. For example, Dr. Asha Rose Migiro, Deputy Secretary-General of the United Nations, became a Member of Parliament through affirmative action at UD. Professor Anna Kajumuloa Tibaijuka, also of UD, has been the Executive Director of the UN-HABITAT since 2000, and up to recently she was an Under-Secretary-General of the United Nations. The President of the Africa Parliament, Mrs. Gertrude Mongela is also a Tanzanian. Even though no Tanzanian man had reached such high positions, yet men and women continue to question women's abilities and even affirmative action.

The deep rooted socio-cultural factors and widespread gender blindness will continue to constrain women's representation in Governments, political parties, employment in general and in science and technology enterprises. Concerted efforts are needed to address these factors in a systematic long-term strategy.

A CASE OF GENDER MAINSTREAMING AT THE UNIVERSITY OF DAR ES SALAAM

Since 1974, UD introduced affirmative action to ensure women's access to UD after the introduction of two year community services by secondary school leavers prior to joining tertiary education. This had led to a huge decrease in women's enrolment. Women in SMT disciplines were admitted directly at UD. In the 1980s many women's groups were established at UD addressing issues of women students' and staff's access to and participation in UD activities. These led to the introduction of gender curricula. By 1994, there were 17 groups coordinated by the Gender Management Committee of which four addressed SMT disciplines.

In 1993, UD started an institutional transformation programme under which it undertook a gender audit in 1994 and started to implement gender mainstreaming since 1994 with a policy approved in 1996. A Gender Dimension Committee was set up in 1996 to institute gender equality and equity at UD through a gender mainstreaming strategy. Ten years later, in 2006, the Gender Dimension Committee was replaced with the University of Dar es Salaam Gender Centre. The Gender Centre adopted the approach of conducting research and policy reviews, undertaking specific affirmative action programmes, undertaking institutional and individual capacity building for gender mainstreaming and forming networks and linkages.

Gender mainstreaming at UD is implemented as an integral policy strategy for promoting equal opportunities. It aims at mobilising all general policy programmes and practices to support the purposes of gender equality and equity. The strategy undertakes specific measures to promote the advancement of women but it also aims to ensure that all structures, values, programmes, policy strategies and core functions are organised in such a way that they equally serve the needs and interests of both women and men. The ultimate aim is to establish a culture in which students and staff members feel comfortable and respected, irrespective of sex and thereby allowing individual talents to develop in the direction that suit them best. Continuous gender-sensitive assessment is carried out to determine the level of intervention from basic "gender sensitivity" to comprehensive, targeted gender programmes on the specific needs and priorities.

Specific programmes undertaken by the UD Gender Centre include gender sensitisation and raising gender awareness to increase the proportion of gender-sensitive men and women students and staff; establishment of an undergraduate scholarship programme, establishment of affirmative action to increase access and performance of women in mathematics, science, and technology education; establishment of early–childhood centre facility, revising and enacting policies and laws to address gender concerns such as gender-based violence, inequalities in opportunities and benefits, etc. Access to a gender-friendly atmosphere and environment coupled with a large group of gender sensitive students and staff through the gender mainstreaming process has contributed largely to the creation of a gender-sensitive community at UD. A clear mechanism and timeframe is in place for monitoring and evaluation of the performance of the various processes and interventions. The external institutional audit of UD also looks at the progress towards gender equality.

These initiatives have led to a notable increase in women students' enrolments and retention at UD, from below 15% in 2004 to about 50% in 2008 in non-science discipline and from 7% in 2004 to 28% in 2007/8 and above 30% in 2009/2010 in science and engineering.

The initial ten-year phase (1994–2003) of the UD gender mainstreaming strategy focused on the quantitative aspect of gender equity aiming to attain gender balance in students' enrolment and staff recruitment and retention. Monitoring of gender equality among students was done and was enhanced by the production of sex-disaggregated data on applications, subject choice, retention, and attainment. A variety of affirmative actions were put in place by teaching units to ensure students' gender equality targets were attained. Monitoring of staff was done by production of sex-disaggregated data on recruitment, promotion and age profiles.

The second phase (2004 – 2013) is an outcome-focused gender equality strategic plan to demonstrate equal treatment of women and men in policy-making, services, education (teaching, learning and research) and employment. For example, staff monitoring is undertaken throughout the recruitment and promotions process, and data on applications, short listing and outcome by gender are produced. This data will assist in identifying whether any occupational segregation exists. Surveys, participatory studies and stakeholder consultative forums obtained qualitative and quantitative data on the staff and student body. The data were examined to inform the strategic plan, to determine issues that were particular to a group and to identify realistic and achievable gender equality objectives. Annual consultations are held with staff, students and other stakeholders to establish the effectiveness of the strategic plan and inform subsequent plans. The gender equality policy and plans aim to promote equality of opportunity for all men and women working and studying at the University, or applying to do so; foster an environment in which unlawful discrimination and harassment are not tolerated; and encourage full participation within the university community.

The university has made much progress towards attainment of set gender equality goals, which are already modest. For example, some targets and affirmative action prescribe a 30% limit instead of 50%. Programmes to increase the number of women in science and technology disciplines provide support for a small number of women. A large proportion of scholarships made available for women end up being diverted to men because gender-related constraints are not addressed.

CHALLENGES IN EDUCATION AND EMPLOYMENT AND WAY FORWARD

More efforts have been devoted to gender equality in undergraduate education. A full investigation of gender equity in higher education requires that we look at all aspects of the academy, not simply at undergraduate degrees. At the master's and the doctoral level, as well as the institutional leadership level, women are greatly underrepresented.

In an attempt to improve gender balance in SMT postgraduate education at UD, exclusive scholarship schemes for women have been introduced since the early 1994 to date. Women can compete for the general scholarship schemes as well. Despite having enough qualified women, a large proportion of the scholarships ends up going to men because the women do not apply even when solicited to do so. Here is a case of gender blindness. It is assumed that women do not pursue master's and doctoral degrees because they lack scholarships. It is not enough to make funds available, it is important to establish why women do not take up these opportunities before making the interventions.

A flexible programme to support women to do PhDs has recently been introduced at the National University of Rwanda (NUR) in order to support women who have been stuck at the master's level for many years. When I was writing the proposal for having the programme funded by the Swedish International Development Cooperation Agency (Sida), I interviewed more than 43 of these women and established that they did not do their PhD because of insecurity in marriage (87%), having young children they could not leave behind (64%), not wanting to do their Ph.D. in Rwanda because of home chores (93%), not wanting to do their Ph.D. in Europe or America because of lack of support at home and of the foreign environment for their children (89%), and carrying the burden of the family since their husbands were also studying (53%). The first batch of seven women got funding in 2009. Six registered in neighbouring countries where they would take their young children with them and their house girls as well. The language and culture in the neighbouring countries is similar to Rwanda's. Their husbands would be able to visit them on weekends. One registered in Sweden; she would visit Sweden for one month every year and would not take her two children with her. The age of the children ranged between several months to 11 years old. To my dismay, it was decided (influenced by the funding agency) that the second batch (2010) would register in Sweden under normal conditions. This has deterred many of the targeted women to apply. Even if allowed to take their young ones, at night and week-ends they would have to struggle to take care of their children and do their studies. Reviewers of the proposal raised many queries about the quality etc. Here we see that a resistance to flexibility prevails, even from those perceived to be at the forefront of gender sensitivity.

Analyses of academic staff statistics conducted at UD show that women's success rates are as good as men's, yet women tend to apply in smaller numbers for academic and senior positions. Women take two to ten years longer for promotion than their male counterparts. While making efforts to increase the numbers of female staff we must first address the slower career mobility for women in higher education.

Science and technology enterprise has long been dominated by men, and the male perspective in policy development, performance evaluation, and interpersonal interactions generally prevails. Work by women is frequently undervalued. Women's unequal childcare and family responsibilities account for some of this differential. Each of these issues leads to a cumulative disadvantage for female employees in SMT.

Domestic issues and responsibilities constitute primary challenges that female science and technology professionals face which affects their performance and progress at work. For example, women are more affected by the low salaries in the science and technology domains.

While male counterparts can earn extra money by going on field trips and working late hours, most women are not likely to do so.

We are yet to see an environment at the work place that is conducive for the reproductive years of the female science and technology workforce. In certain science and technology workplaces, policies that protect pregnant women and nursing mothers working in certain conditions that can be health hazards are needed. These policies should be enforced and women should be made aware of such policies and potential hazards.

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