

**ENCOURAGING GREATER ENROLLMENTS OF WOMEN
IN SCIENCE AND TECHNOLOGY:
THE MALAWI POLYTECHNIC EXPERIENCE**

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INTRODUCTION

Roles in Malawi are characteristically gender determined, gender directed and socially endorsed and perpetuated. The woman is by definition and by virtue of her gender, destined to be looked down upon and to play arduous domestic roles ranging from agricultural production, fetching water and fuel wood, in most cases miles away from home, preparing meals for the family and caring for the young and the elderly. With the growing HIV and AIDS problem, women also play a great role in caring for the sick, being there for the dying, as well as mourning the dead, consoling the bereaved and looking after orphans.

One cannot, therefore, divorce history from any study of women and girls marginalisation in any discipline as history shapes who we are. Cham'dimba and Chidam'modzi (1995) observed that the marginalization of women is rooted in the Malawian culture where traditional or cultural practices play a fundamental role in ascribing statuses to men and women. They contend that men have been in the forefront of ascribing these roles to women as, they, the men, and benefit more from this status quo. Davison and Kanyuka (1992) argue that the critical problems precluding development in Malawi, including shortfalls in food production, inadequate health care, and a rapidly increasing population, will not be solved unless women's pivotal role in the development process and unequal access to development benefits are addressed. They see education as the key link in the process.

Davison and Kanyuka (1992) go on to discuss the concept of gender structuring advanced by Jagger (1983). This refers to the means by which a society orders relations of production, reproduction, and distribution between females and males from the household to the nation state. They observe that, these behavioral norms and expectations begin in the home and in the community and are, subsequently, taught and reinforced in the school setting limiting girls to domesticity and boys to productive careers. Most significant is the observation that, the career aspirations of parents and guardians for their girls and the girls' own aspirations in Malawi, were much narrower in range than those of boys. The choice of careers for girls was limited to four (nurse, teacher, doctor, or secretary) whilst boys aspired to be pilots, engineers, mechanics or clerks, Administrative Officers or teachers. Further, in Malawi, girls are not expected to perform academically the same way as boys nor are they expected to achieve at the same rate. Girls are also expected to be shy and submissive and are less apt to ask questions.

Tradition does not help matters as initiation experts reinforce femininity in girls, which celebrates the male species and their self-fulfillment while undermining the autonomy of the girls. Cham'dimba and Chidam'modzi (1995).

Alide writing in 1999 observed that the illiteracy rate for girls in Malawi is 68.4% and this has implications for their economic and socio-cultural status. Alide discusses a 1991 World Bank report

which outlined that at the early stages of education in Malawi, the number of girls is equivalent to that of boys but as they progress, the dropout rate for girls is higher than that of boys and the time they finish secondary education, a third of the initial intake of girls would have dropped out, Alide (1999).

Kadzamira (1987) conducted a research on women in science in Malawi. She found that boys outperformed girls in science subjects. According to Kadzamira, (1997) throughout primary and secondary education, boys in Malawi outperform boys in almost all curricular areas except Chichewa and Bible Knowledge. Although the gender gap is seen to be decreasing she observes that the performance differential between boys and girls is widest in Mathematics and Science subjects Kadzamira (1997). Curricular biases, apart from inherited socio-cultural factors have also contributed to the marginalisation of girls in Science subjects. These have been noted in the portrayal of girls and boys in science textbooks, which have influenced boys to tune into science subjects and girls into the domestic sciences Kalyati (1996). High dropout rates of girls from primary and secondary education, and also historic exclusion of pregnant girls from continuing with education as well as the attitudes that reinforce girls traditional roles and the generally low overall performance of girls in the sciences places them at a great disadvantage in terms of competing for recognition in Science and Technology related disciplines, Kalyati, (1996). It is not surprising, therefore that at Tertiary level and in the world of employment, Science and Technology is minimally represented by females.

The Science and Technology policy for Malawi acknowledges that although 52% of the Malawi population is female the participation in and utilization of Science and Technology by women has not received the attention it deserves. Not many women are motivated to study Science and Technology and the development and transfer of technology does not focus on women. Science and Technology policy for Malawi (2001). Girls' poor performance in general and in Mathematics in particular should be a cause for concern if social justice is to be promoted in Malawi, Chamdimba (2003).

MALAWI POLYTECHNIC

The Malawi Polytechnic opened its doors to the first students in 1965. The College then, was predominantly a technical college mandated to provide technical – vocational training for industry and Malawi Government ministries. In 1967, the Polytechnic became a constituent college of the University of Malawi and assumed control of all Diploma programs. The Polytechnic still maintained control of craft programs under the Board of Governors whilst Diploma programs were handled by the University of Malawi who were responsible for curriculum development, staff recruitment, and training, resource mobilization and funding among other duties. The Polytechnic has since grown to the status of a full fledged university housing five faculties namely: Education and Media Studies, Engineering, Applied Sciences, Commerce and Postgraduate Studies and Research. These faculties offer predominantly undergraduate programs in the various disciplines. However, the introduction of the faculty of Postgraduate Studies and Research is intended to act as a springboard for the development of postgraduate programs. Currently, the college is offering a Masters in Business Administration (MBA).

Are women, visible in all this? Statistics indicate that the participation of women in Science and Technology related disciplines has seen some growth over the years.

Between 1999 and 2003, the Environmental Health program has grown from 9% to 27% female intake, the information Technology, Business Information Systems and Laboratory Technology Diplomas are at 50% female intake, whereas the Bachelor of Technical Education has grown from 8% to 39%. Civil Engineering (B.Sc.) has seen a minimal representation of females growing from 7% in 1999 to 9% in 2002. Electrical Engineering has grown from 13% to 15% and Mechanical Engineering has had no female representation over the past four years. The degree in Architecture (mature entry) has had interesting statistics ranging from 33% in 2000 to 31% in 2003 in terms of female representation. The

Bachelor of Accountancy program which is Mathematics competence based has also seen an increase from 14% to 25% between the years 1999 to 2002.

AFFIRMATIVE ACTION

The visible increase in the number of girls enrolling for Polytechnic courses generally and the sciences in particular has been due to the efforts the university has made to lower the cut off point for girls. Girls' qualification to enter into the University of Malawi was, in the mid nineties, through a silent unwritten policy, lowered from the requisite minimum of 30 points to 36 points whereas boys could only enter the university on the basis of 30 point overall score or lower - the lower being higher in terms of academic achievement. These efforts continue to this date. On the new entry requirements which are based on an average score between Malawi School Certificate of Education results and the University Entrance Examinations, girls are selected on the basis of scores as low as 55% whereas the cut-off point for boys is in the 60s.

Efforts to increase the participation of women and girls in Science and Technology at a lower level have also included the removal of restrictions which barred girls in some schools from Science and Technical subjects and promoting guidance and counseling services aimed at encouraging girl's participation and achievement in subjects traditionally considered as male domain, Ministry of Education and Culture (1997)

In 1987 – 1988, The Polytechnic benefited from the Malawi Governments Human Resource and Institutional Development (HRID) project, which was funded by USAID. The funding was also used to build girls' hostels whose sole purpose was to increase female intake in non-traditional disciplines. Traditionally, the Polytechnic was built around greater male enrollment with two hostels for males against one for females. With the HRID funding the number of females hostels doubled to two. However, male hostels also tripled and in the process, the status quo was maintained. Currently, the total bedspace for female students is 260 while as the total bedspace for the other gender is 820, representing 30.2% and 68.8% respectively.

Scholarships and Departmental Efforts

Among other things, the HRID program had as a component, a scholarship scheme for girls in non-traditional disciplines. The scholarship scheme benefited a few of the girls who opted to study science related disciplines. Further, according to the Engineering lecturers, efforts have been made to ensure that the girls who enroll on their programs receive extra support and tuition. This has been in an effort to retain them on the programs realizing that they may have entered the program on a slightly weaker footing than boys in terms of their overall scores at secondary education as stated earlier. Due to these efforts, the girls, though very small in numbers, have, in some instances outperformed the boys. Some of these high performing girls are now lecturers: two in Civil Engineering and two in Electrical Engineering. In the final year of the Electrical Engineering class for the 2002/2003 academic year is yet another star performing female who is, according to her lecturers, material for staff associateship.

Concerted efforts are being made to deliberately recruit female scientists as lecturers and also to encourage them to take on mentoring for young girls and women. Invitations to career talks from schools are all too common for the female scientists. Female scientists and educationists at the Polytechnic are also actively involved in highlighting the gender disparities in the Science and Technology disciplines with the view to influence policy direction in favor of women and girls. This is done at a national level through involvement in organizations such as Forum for African Women Educationists, a regional NGO based in Nairobi, Kenya with a Malawi chapter called FAWEMA. Through FAWEMA, various interventions to encourage female participation in the sciences were carried out through a project called

Female Educationists in Mathematics and Sciences (FEMSA) The aim was to promote the teaching of Sciences and female performance in the sciences.

Efforts by Female Lecturers

Cham'dimba and Chawanje, lecturer and Head of Mathematics and Computing and Dean of Faculty of Applied Sciences respectively, have further joined forces to write a position paper entitled "Proposal for Affirmative Selection Policy for Female Candidates into the Faculty of Applied Studies." This emanates from their concern that females are underrepresented in the science related disciplines due to the low achievement at Malawi School Certificate level as the previous citations suggest. The present University selection criteria stipulated that students need to score at least a credit in Mathematics and science subjects at MSCE but unfortunately most girls fail to meet this requirement. Chamdimba and Chawanje are advocating for affirmative action where girls with marginal science and mathematics grades could be enrolled into the University and undergo a one year summer school/vacation pre-entry course and sit for exams and once they pass, could be admitted into the Polytechnics science based programs. Other countries, such as Dar-Es-salaam have reportedly implemented such a strategy from 1998 to date. Chamdimba and Chawanje (2003).

Female scientists at the Polytechnic are also engaged in research, which is contributing to a growing body of literature on the teaching of Mathematics and Sciences in Malawi. Noteworthy are, again, the efforts of Panji Cham'dimba who has written, researched and also published her research findings. One of her publications is an article entitled 'Gender – Related Differences in Working Style During Cooperative Learning in Secondary School Mathematics: A Malawian Case Study'.

Following the enrollment and negative performance trends of girls in Mathematics and the Sciences, Cham'dimba's case study targeted a co-education secondary school and worked with on teacher to introduce cooperative learning strategies as a way of encouraging girls to excel in the sciences. Cham'dimba's study formed the basis for challenging Malawi government's strategies for enhancing participation of girls in education (and mathematics) by increasing numbers without paying attention to the classroom environment to reduce dropout and raise achievement. Her study aimed to enhance the learning of girls in Mathematics from a pedagogical perspective. The study revealed that the whole class question/answer teaching approach commonly used in Malawi for Mathematics and teaching disadvantages girls in their learning of mathematics. All girls, according to Cham'dimba, stated that they preferred the cooperative approach because they felt safer to contribute their ideas or ask questions for clarification in a small cooperative group rather than in front of a whole class. Cham'dimba (2003). The results of Cham'dimba's interventions cannot be used to conclusively draw linkages with increases in female enrolment at present but they are nonetheless, very crucial.

Problems

Without lowering the requisite scores for girls to enroll into the University of Malawi, it would have been difficult, if not impossible to increase female participation in the University in general and in Science and Technology in particular. The targeted scholarship schemes also enabled girls to have the financial support necessary for them to sustain their efforts in the program. These targeted scholarships resulted in the departments of Civil and Electrical Engineering recruiting two females into lecturing positions. Both these females are star performers on the program. This year, the electrical Engineering Department is proud to be associated with one of their female candidates who is outperforming the boys in the program.

Arguments against lowering the requisite scores for entry into the University have been advanced by some academicians. They have contended that girls should compete on an equal footing with the boys and that they should not be seen to be being favored by the system. The second problem has been that due

to the traditionally low participation of girls in Science and Technology from primary school through secondary school, lowering the entry qualifications for girls has little viability because the qualifying numbers even at the higher cut-off point are minimal.

At policy level, this effort has been predominantly unwritten in that no concerted effort has been made to formalize it. As such, its survival depends on the prevailing mood in regard to gender issues. Sadly in one instance, it was a female lecturer who categorically stated that girls need not be favored in this regard and that they should compete equally with boys. This was an unfortunate statement.

In courses where there are no support mechanisms for girls, it appears that the girls are struggling in the sciences. A glance at the scores in Environmental Science, for example, demonstrates that the girls seem to be struggling in Physics and mathematics to a larger extent than the boys.

This case study, therefore is a milestone in the Polytechnic's efforts to increase greater participation of girls and women in Science and Technology because it does not make the assumption that girls are available and ready to take up careers in Science and Technology. The video targets young girls in their formative years when they are subject to a multiplicity of influences and can be motivated. In this regard, the visual message is intended to enable them to see other women occupied in professions they, the girls, would not meet on a normal day to day basis. The impact is intended to be motivating, stimulating and encouraging. More and more girls will, therefore, see the need to work hard in Science and Mathematics and also, to apply for the so-called non-traditional disciplines. Only then, will there be a case for increasing bedspace allocation for girls.

THE CASE STUDY: 'A WORLD OF CHOICES' DOCUMENTARY VIDEO

This study sought to explore the experiences of young girls and women who have opted for Science and Technology related disciplines. The study was conducted in various training institutions with a Science and Technology bias and also in industries with Science and Technology related occupations. Data collection involved a structured interview, which culminated into a story line for a documentary video production. The study was predominantly qualitative with the girls being identified, not because they formed a representative sample in scientific terms, but because they were either undertaking a Science and Technology related course or because they now have a career in Science and Technology having completed their studies. Young women who are currently training and some young women who had made the choice, trained and graduated in careers in Science and Technology were interviewed in their school/College setting or work environments, respectively. All the interviews were video recorded. These scenes of the video recording included girls in normal classroom/workshop settings. These workshops included Motor Vehicle Mechanics, Electricals, Bricklaying, Laboratories, Carpentry, Furniture making and basketry. The results of the study culminated into the production of a 20 minute documentary video entitled 'A World of Choices.'

The Story Line

A story line which sought to capture the experiences of these girls and women was developed. The story line sought to capture the factors that had come into play to influence the young girls/women to develop an interest in Science and Technology related disciplines. *Feelings of family and friends* were explored and *information sources* for such career choices were also explored. This was intended to capture some of the socio-cultural barriers that women face when they go into what are perceived as 'men' jobs. This is intended to motivate the girls who are watching to acknowledge these perceptions and be able to challenge them in future. The story solicited information on possible *mentors* to the young women and girls who may have *motivated* them. *Socio-cultural* factors were explored in questions that solicited

reactions from “other people”. *The role of family* including parental influences and the girls’ own **feelings** were explored.

Knowledge of Mathematics and Science was also an element of note. It was expected that the girls would use Mathematics and Science on a constant daily basis. Experiences were therefore sought on the motivational factors relating to Mathematics and Science and the applicability of these subjects to the professions.

Feelings of self-esteem were sought in order to find out whether the girls were satisfied with their career choices. These were intended to capture the degree of self-satisfaction and pride in their chosen profession in order to motivate the viewers. *The challenges* the girls met along the way were explored. These were intended to capture the most common problems girls may have including lack of self-esteem, socio-cultural biases and discrimination. *The world of work* was also a subject of discussion where the girls were requested to discuss employment matters. Several words of advice to the female viewers aspiring for such careers were solicited in order to inculcate an open minded spirit in them and to open up their eyes to careers they would have hitherto considered inappropriate for themselves. *The role of parents* and an awareness raising element to enable them to understand their place in the training and encouragement of young girls to venture into Science and Technology and also, to challenge their own stereotypes was part of the story. *Policy makers* were also requested to comment on Government of Malawi’s gender equity policies. The story ends with a series of actions points in the forms of advice to the girls and these are discussed as part of the findings.

RESULTS AND DISCUSSION

The Professions

Technical Colleges, the study found, have been instrumental in the training of girls in technical programs such as Motor Vehicle Mechanics, Auto Electricity, Carpentry, Bricklaying and Basketry amongst other courses. The Polytechnic, on the other hand, has produced Laboratory Technologists, Civil and Electrical Engineers, IT specialists and Environmental Scientists and as the statistics indicate, the numbers are growing. The video however attempted to create a balance between the trade-related disciplines and the academically oriented disciplines bearing in mind that a large percentage of Malawi School Certificate holders never make it to university but may be eligible for entry into technical schools.

Feelings Of Family And Friends And Motivational Factors

Most of the girls acknowledged the support of their families in their choice of career. Both mothers and fathers were said to have been very supportive to their daughters’ non-traditional career choices, perhaps, a sign of a shifting world-view. For some, their male siblings acted as role models and provided a forum for the girls to test their skills and gain confidence. One girl was always invited by her brother to accompany him to his Motor Vehicle Mechanic Workshop. She is now a Motor Vehicle Body repairer. Parents were also instrumental in encouraging some of the young women to build a strong foundation in Mathematics and the science. Other girls were motivated by practicing professionals. For example, a young girl from Lilongwe Secondary School was inspired to excel in the sciences by Felistus Mkandawire, the only female pilot in Malawi today. However, fellow girls reacted negatively to their friends’ career choices, retorting in some cases “why did you choose such a career?” In some cases, the girls’ friends were known to poke fun and laugh at their friends’ ‘strange’ career choices. The girls however, acknowledged the support they received from their male classmates. They found them encouraging and generally supportive. The girls did not at all look intimidated in any of the workshops. One Don Bosco student was clearly glad to have females in the Motor Vehicle Mechanics course and went further to argue that the gender-gap in such courses needed to be bridged. This is perhaps an

indication that given the right stimuli, and the right environment, boys might act as catalysts to close the gender divide by encouraging females to excel in the sciences. Girls who feel intimidated by these male dominated domains may be inspired by such positive remarks.

Knowledge Of Mathematics And Science

It was generally acknowledged that in order for the girls to excel in technical careers, they had to work hard in Mathematics and Sciences. Some girls pointed to the support and encouragement they received from parents from an early age. Some acknowledged the support they received from their teachers, who instilled in them the need, for example, to practice, practice and do more practice in Mathematics. Others went deeper to explain concepts of science that one needs to apply to their specific trades. The girls acknowledged the fact that there are a lot more career opportunities for girls with qualifications in Mathematics and Sciences. They were also in agreement that Mathematics and Sciences were crucial subjects though difficult to master.

The Work Environment

All the girls found the world of work very accommodating and supportive. The predominantly male environment did not intimidate them, and they found their colleagues very supportive. No attempt was made, however, to visit a construction site where females were engaged in bricklaying as an actual profession. There have been reports that such sites can be unfriendly and unwelcoming to the female gender. The only female architect in Malawi, Dekha Katenga, discussing her experiences at a Women's Forum stated that upon her arrival at a site meeting she would be asked whether the Architect would also avail 'himself' for the meeting. She always had to make a deliberate statement that she was, in fact, the Architect.

Considerations For Self Employment

Self-employment was a considered option for some of the women. They would wish to operate manufacturing businesses in the furniture industry, Motor Vehicle Mechanics workshops as well as construction companies. They, the girls, perceived economic benefits of self-employment as overriding those accrued from the world of work.

Physical Prowess

Although the young women in employment and the girls still in school acknowledged that they were, at times, physically challenged, they did not consider this as a deterrent in their efforts to excel in the, sometimes, physically demanding chores associated with their occupations. They applied themselves, and with practice, the tasks became easier and easier. It was visually appealing to see them undertaking various taxing roles in the workshops.

Satisfaction With Career Choice

Most, if not all, of the girls and young women were satisfied with their career choices and expressed intense satisfaction. Those in employment were also pleased with their wage packages.

Stereotypes

All the girls challenged the view that the sciences were not for girls. They said that those who subscribe to this view use it as a ploy to keep the girls out of lucrative careers. They challenged parents to encourage girls as well as boys to play with electronic gadgets. Although the girls in the video clearly

had supportive parents who underscored the need to work hard in the sciences, they stated that some parents prevent girls from playing with electronic gadgets in the home. Instead, they push the girls to the kitchen and take it for granted that the boys will understand the operations of the gadgets.

Advice To Girls

Be open-minded, work hard in Mathematics and Sciences and start thinking of a career choice early on in life. Most of all, the young women say “go for it!” The girls dispelled the myth that technical jobs are dirty. One can get clean after work and there is no conflict between the dirtiness of the workshop and the cleanliness of a person outside the workshop. A lab technologist urges the young girls to be serious about their education and apply themselves in Mathematics and Sciences if they are to excel in the technology age. The advice section ends with Dr. Naomi Ngwira, an economist and gender expert from University of Malawi, Chancellor College, urging the girls to take-up technical careers. She says, considering that women make-up more than half of the Malawi population, it is imperative that they contribute to the socio-economic development through Science and Technology. She urges government to make education for girls technical vocationally oriented to enable the girls to be productive should they drop out of school.

The video ends with the following general advice to girls aspiring for a career in science and technology.

1. Keep a diary or notes about your career dreams
2. Talk to people who work in jobs that interest you
3. Make a scrapbook about people with jobs you admire
4. Join a Science Club or any after school club
5. Read about interesting jobs in newspapers, magazines or library books
6. Start a hobby that can be developed into a career that interests you
7. Ask your teachers for information about career choices

EXPECTED IMPACT

It is expected that girls in most primary and secondary schools in Malawi will view the video. The prime targets are young girls who are still in the formative years of their education. The team makes the assumptions that viewing and listening to young women who are engaged in non-traditional occupations will encourage these girls and women to aspire for such careers and to be able to face up to the predominantly negative social-cultural attitudes. In a nutshell, more girls will opt for science and technology careers and will compete for such courses at the Polytechnic and other training institutions.

PRACTICAL ADVICE TO CONFERENCE PARTICIPANTS

- It is important to study and understand the policies practices and procedures guiding lower levels of education as these have an impact on the performance of girls at tertiary levels.
- It is also important to understand the socio-cultural dynamics as these determine the types of interventions that would work best given the prevailing circumstances.
- It is important to hear the voices of the girls. They are in a better position to articulate their problems vis a vis the learning of mathematics and Sciences and to propose solutions to some of their problems. They are also the best role models for their peers.

- Female academics should themselves be actively involved in advocating for the increased enrolment of girls and women in the sciences. Men will not speak for us.
- Data are crucial. One cannot make conclusive statements without statistical information as to the trends of the subjects under study.

CONCLUSION

In conclusion, any attempt to increase the participation of women and girls in Science and Technology must begin with the socio-cultural framework and proceed to dispel the myths, assumptions and beliefs that have prevented women from competing favorably in such occupations. As society begins to free itself from these imprisoning and counter-productive assumptions, concerted efforts by governments, educational institutions and other stake holders will inadvertently see greater enrollments of women and girls in Science and Technology related disciplines. Consequently, women, who make up 52% of the Malawi population, and are currently a very under-utilized resource that can be effectively, employed in the development endeavors of the nation if equipped with the right training.

THE AUTHOR

Flossie Asekanao Gomile-Chidyaonga is currently Dean of Postgraduate Studies and Research at the University of Malawi, Polytechnic. She graduated with a BA (Honours) in English Language and Literature from the University of Malawi in 1982. In 1984, she obtained a Postgraduate Diploma in Linguistics from University of London and in 1987 she obtained an MSc. in Applied Linguistics from the University of Edinburgh in Scotland. Since joining the Polytechnic, Flossie has served in various capacities including Lecturer in Language and Communication, Head of Language and Communication Department, Senator to University Senate, Member of University Council and Dean of Applied Studies. She is also a gender activist who has contributed to research aimed at improving the socio-legal status of women through the Women and Law in Southern Africa Research and Educational Trust (WLSA). Through WLSA, Flossie has contributed to the research and authorship of two books entitled *Dispossessing The Widow: Gender Based violence in Malawi* and *In Search of Justice: Women and the Administration of Justice in Malawi*. Flossie has also held various public offices including member of the Board of Directors of Malawi Development Corporation (MDC) and chair of the then Malawi Professional Women's Association. In addition she has served on the Malawi Vision 2020 working group and on the Law Commission. Flossie is a Hubert H. Humphrey (HHH) Fellow and her research interests include media and gender, language and development, gender and the law, and gender and HIV/AIDS

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