SCIENTIFIC, TECHNICAL AND VOCATIONAL EDUCATION OF GIRLS IN AFRICA

Guidelines for programme planning

by

Dr Jane Mulemwa

Section for Science and Technology Education
Section for Technical and Vocational Education
Working document 1999

Contact:

Anna Maria Hoffmann-Barthes
Programme Specialist
Section for Science and Technology Education
UNESCO
7, place de Fontenoy
F-75352 Paris 07SP
Fax. +33-145685622
Email AM.BARTHES@UNESCO.ORG

PREFACE

This booklet has been commissioned by UNESCO within the framework of the UNESCO Special project on "Scientific, Technical and Vocational Education (STVE) of Girls in Africa", a joint project of the Sections for Science and Technology Education and Technical and Vocational Education which collaborates with bodies that have similar interests such as the "Female Education in Mathematics and Science in Africa" (FEMSA) and Gender And Science And Technology (GASAT).

The booklet is concerned with the promotion of girls' participation and performance in STVE. It is primarily written for the developing regions, particularly Africa, where the gender gap in STVE is still very wide. It is intended specifically for teachers and curriculum and material developers involved with STVE at the upper primary and lower secondary school levels, covering the areas of: 1. Curriculum and Educational Materials; 2. Teacher Training; 3. Guidance and Counselling; and 4. Motivating Girls.

After a general introduction, each area is discussed in a chapter of its own, starting with an introduction in the form of the gist of the matter. The issues are then discussed in some detail, followed by a discussion of some strategies to address the issues. Some practical ideas and suggestions to be considered as well as exercises that can be done to stimulate deeper thought into the issues are given at the end of each sub-section or chapter as appropriate. Each chapter ends with a "concluding thought".

The booklet is based on the author's own lived and practical experiences and ideas gained, conceived and developed over 23 years as a school science teacher, teacher educator, researcher and counsellor. It is hoped that the suggestions, ideas and exercises outlined will be of practical and immediate use especially to the categories of educators targeted by the booklet.

The major objective for this booklet is to sensitise, raise awareness and increase understanding of the gender issues in STVE, with a view to mobilising support that is needed to eradicate the problems that girls experience in the study of STVE. Since women form the "other half" of the human resource of any society, their active and full participation in STVE and related jobs and careers is a necessity if our societies, nations and regions are to achieve fast, appropriate and relevant development in the 21st century. It is hoped that this booklet can activate the reader into joining and/or increasing the efforts to ensure that girls too access, actively participate, enjoy, and succeed in STVE and the related jobs and careers.

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INTRODUCTION

THE PROBLEM OF GIRLS' POOR PARTICIPATION IN STVE

0.0 A Brief Background to the Issues

It has long been known that girls' access to and participation in education in general and to science, technical and vocational education (STVE) in particular is generally poorer than that of boys. Evidence of this fact has been through various studies at national levels and by international organisations such as UNESCO and "Gender And Science And Technology" (GASAT). The situation has been so poor world-wide that the 4th UN Conference on Women, Beijing, 1995, had **"Girl-Child Education"** as one critical area of concern.

During the past 30 years, the belief that some basic knowledge of science is in some way important to the intellectual development of all students has been entrenched. There is plenty of evidence that knowledge and skills in science, technology and vocational subjects is not only important for the satisfactory standards of living and welfare of individuals, but it is also vital for the development of any society or nation. In fact the degree of development of any society or nation can be gauged from the scientific, technical and vocational capacity of its peoples. This realisation resulted in a world-wide reform in science education **"Science and Technology Education (STE) for All"**. At the basic level, science for functional literacy is closely woven with technical and vocational education and hence this booklet will address it as **"Scientific, Technical and Vocational Education (STVE) for All"**.

The need to promote a world community of scientifically and technologically literate citizens was recognised as urgent by the World Conference on **"Education for All"**, which took place in Jomtien, Thailand in March 1990. As a follow up to this conference, the **Project 2000+,** a joint venture of UNESCO and various governmental and non-governmental partners, was initiated in 1993, within the framework of the World Declaration on Education for All. Project 2000+ is a world-wide project which primary goal is to promote and guide the implementation of the scientific and technological dimension of basic education in the context of education for all. It is aimed at improving the relevance and the teaching and learning of science and technology (S&T) so as to bring about a faster development and more thorough infusion of a scientific and technological culture into all societies of the world.

The gender gap in STVE is far greater than that in other fields of education, with the girls lagging very far behind the boys in access, participation and performance. In the past, sciences in particular used to be pursued by a very small minority of relatively very bright students who were usually male. The

technical and vocational fields were then perceived as requiring a lot of physical strength and tenacity, and hence a male domain too. Over time therefore, the girls/women became almost completely excluded from these areas of study and hence from the STVE-based jobs and careers.

Today, the reform of **"STE/STVE for All"** requires that every individual be targeted for STVE instruction even though most of them are not likely to pursue these studies to higher than basic levels. Consequently, the essential or core STVE content has to be redefined. STVE has to be taught and learned from within the cultural context so as to ensure relevance and create interest in the learners. The content should focus more on societal issues and needs to be integrated as opposed to the traditional compartmentalised disciplines. Furthermore, the methods of teaching have also to change and be more accommodative of the different abilities, interests and potentials of the learners. The role of teachers must change from that of instructors to that of facilitators of learning, involving the learners more actively in the search of information and construction of knowledge.

A major implication of this new trend of "STVE for all" is that the girls/women can no longer be left behind, and hence this booklet on major gender issues in STVE and the promotion of girls' participation in these fields, right from the primary and lower secondary school levels.

0.1 Girls' Poor Access and Performance in STVE

As indicated above, it is a known and well-documented fact that girls' access and participation in STVE is poorer than that of the boys. This status quo had for a long time almost been accepted as "natural". Consequently, little or no efforts at all were made to redress the glaring gender imbalances in education, let alone STVE. Today, however, the world has woken up to the fact that the girls'/women's seeming lack of potential in education in general and STVE in particular, is as a result of many factors in their up-bringing and their social-cultural environment, and far from being hereditary or natural!

The developed world came to this realisation some time ago and many studies documented the major reasons for girls' observed poorer participation and performance. There is plenty of work that has been done to redress the situation and as a result, the gender gap in education and even in STVE is narrowing fast in the developed countries. In comparison, many of the developing countries are still grappling with systematic, gender-focussed research and interventions to address the issues. In the Africa region, recent studies such as those by UNESCO's Special Project on Scientific, Technical and Vocational Education of Girls in Africa during 1996-1998 and by the Female Education in Mathematics and Science in Africa, FEMSA during 1996-1999, have revealed that the gender gap is still very wide in education

and STVE in particular. The reasons for the girls' poorer access and participation in STVE are known and efforts to remedy the situation are intensifying.

Many of the major factors that inhibit girls' participation and good performance in the STVE field have been found to be similar across countries and regions. Those that are common include, gender-biased curriculum and other educational materials; poor teaching methods and classroom practices and hence pointing to teacher training; lack of appropriate guidance and counselling of students, particularly girls; and the lack of encouragement and motivation to the girls to pursue studies in these fields.

Personal experience and discussions with others have revealed that the few girls, who have so far excelled against this discouraging background, have taken the negative situation as a challenge and worked to prove it wrong. Otherwise, some research has indicated that these girls also tend to come from families, communities and schools that have given them a lot of support and encouragement in their studies.

0.2 Concluding Thought

In this booklet I discuss the above four stated problem areas and give some suggestions of how girls could be assisted and motivated to work hard and perform well in STVE, at the upper primary and lower secondary school levels.

There are however quite a few other problems that have been found to hinder girls' access and continued participation in STVE in the developing countries, particularly those of Africa. These range from lack of physical facilities at school such as sanitary facilities, through the loss of opportunities on the "marriage market" because of the longer duration of STVE courses, to the relative lack of job opportunities for girls compared to boys. These and other problems and issues that may be peculiar to individual sub-regions or countries need to be identified and seriously addressed so as to promote girls' participation and performance in STVE.

Furthermore, it is true that given the very narrow STVE industrial base in most of the African countries, there are relatively few STVE-based jobs and careers than would be expected in an industrialised society. This fact has got to be recognised and learners assisted to realise the importance of STVE not only as a means to a job, but more so as a way of thinking, a way of understanding the world around us, and hence a way of life.

CHAPTER ONE

CURRICULUM AND EDUCATIONAL MATERIALS

1.0 The Gist of the Problem

The issue of inappropriate and irrelevant content in scientific and technical curricula is well known in many developing countries, where such curricula were adopted, around the 1960's, from the developed countries with little or no modifications at all. It should be remembered that at that time, these areas were intended for only a small minority of very bright students who were invariably males and who were often destined to a related career. It is therefore not quite surprising that the content for this elitist group of people was not only very highly theoretical but also gender-biased in favour of the males. Industrialized countries have now proceeded to changing these curricula, but many of the developing countries continue to use them in their original gender-biased forms. For example, the FEMSA studies (1997) found that,

> *"Most mathematics and science syllabuses do not take account of the needs of girls in their lives after school, both at the primary or secondary level. Most secondary school syllabuses put far too much emphasis on definitions, laws, formulae and abstract procedures and little on mathematics and science as a way of thinking and looking at the world around us".*

In-depth systematic studies have revealed a lot of gender issues in the curricula and in the other educational materials and it is believed that these do directly or indirectly affect the learners. These materials are usually positive and encouraging for boys and men, where as they tend to be negative and discouraging for the girls and women.

1.1 Gender Issues and the Content

The content of many science-related curricula and other educational materials tends to build more on the experiences of boys and totally ignores those of the girls. The examples used, and illustrations included in these materials are more directly related to what is traditionally known to be of male interest and experience. This should perhaps not be so surprising given the fact that the authors of these materials have for a long time been males and hence it is only natural that they have found it easier to draw on their own experiences and reflect their interests.

1.1.1 The topics and Illustrative Examples

While the actual concepts and principles of STVE may be universal, the way they are introduced and illustrated should be put into context to facilitate understanding. In so doing, the gender and other cultural issues would inevitably come into play, as illustrated by the following examples.

While a lot of science and technology (S&T) is encountered in the home, and particularly in the kitchen, this fact is hardly ever used to introduce concepts/topics such as Heat and Temperature, Boiling, Solubility and Solutions, Pressure Cooking, Prevention of Rusting, Food Preservation and Waste Management and Disposal. Topics like "Moments" and "Levers" only use examples like the bicycle and mechanical levers which most boys are familiar with but not most girls. In so doing, the boys "light up" with interest and enthusiasm, because the teacher is explaining details of familiar things while the girls try hard to imagine what is being discussed. The boys therefore participate actively, appear brighter and cleverer than the girls, and the teachers "move on with the active pupils", leaving most of the girls feeling lost and discouraged. The principle of levers could equally be demonstrated using bottle openers, weighting balances, and the human body joints which girls are familiar with.

Similarly, a lot of technology at the basic level can be taught starting from activities and experiences of girls too, in addition to those of boys. For example the concept of appropriate technology can be taught using examples of labour-saving and timesaving devices that are of direct assistance and hence interest to girls like energy-conserving stoves, water pumps and heaters, nut-shellers and grinders. This would be in addition to the usual examples such as the pulley systems.

Therefore, quite often the boys tend to show interest and enjoy the STVE subjects while the girls don't, simply because the syllabus content tends to build on the experiences of boys, which are often unfamiliar to girls. This violates one of the principles of facilitating learning, in the case of the girls, namely, "teaching from the known to the unknown". Furthermore, the girls may fail to see the use and relevance of the content to them and hence loose interest early in the course.

IDEAS AND SUGGESTIONS

- The STVE content should be gender- inclusive and appropriate to the learners. For each topic you prepare to teach, think of at least two illustrative examples, one each from the general experiences of boys/men and girls/women in your area.

- Where it is difficult to think of alternate examples, outline the possible "cultural baggage" and problems and issues that girls are likely to bring to class, which will hinder their learning of this topic or content.

- Try to assist the girls to overcome the problems identified above through more attention and assistance to them, and where appropriate extra tuition and work.

- Extra help and work to assist girls must be given with caution so as not to stigmatise them "as stupid" and hence discourage them even more.

EXCERSISE

- Take two topics that you enjoy teaching and for each of them, develop a different way of introducing and/or teaching the concepts and principles involved, using generally female experiences. These materials will be "girl-friendly".

- Carry out a similar exercise for at least one topic a week and encourage your colleagues to do the same.

- Share, discuss and improve the "girl-friendly" materials at least once a month.

- Appropriately supplement the content in the textbooks with the "girl-friendly" materials you have developed. You now have a gender-inclusive content for these topics. Continue the exercise for different topics.

1.1.2 The Language and Pictorial Illustrations

In addition to the content and examples as demonstrated above, the language and the pictorial illustrations have often left out girls and women. The written text refers to men and boys and the pictures too hardly show any girls and women. Furthermore, the few pictures that may show girls and women depict them in the passive rather than the active roles, or in the typically female stereotyped roles. For example, it is always the men who are shown driving cars, repairing or working with machines, while the girls and women are often shown bathing babies, cooking or manually undertaking house-hold related work. A picture of a farm often shows a man working with the plough or tractor and the woman sewing the seeds by hand, but never the other way round. Most pictures of students in a laboratory or workshop show the boys actively engaged in some activity like measuring or carrying out a titration, while the girls simply look on, or are not even included.

The unwritten message given by the above materials is that the girls hardly have a scientific or technical potential. The learners, both boys and girls, are therefore indirectly "brainwashed" into believing that girls and women can not successfully pursue scientific and technical education and related careers.

IDEAS AND SUGGESTIONS

- Pictorial illustrations should not reflect the *current temporary reality* that there are very few women in the scientific and technical fields. Instead, the desired goal of gender-equity in STVE should be reflected. Apart from the purely biological reproductive roles, both boys and girls can do all activities often shown in educational materials equally well.

- The language and content that depicts gender-equity will psychologically encourage girls and women to rise up to the challenge and hence gender-equity will be achieved sooner than later.

- Gender-balance in language and representations also psychologically help the boys to realise and accept that girls have the potential to perform equally well.

EXERCISE

- Critically examine one of the text books you use for gender biases by:
  - Counting the number of times the boys and their corresponding pronouns are referred to compared to girls;
  - Counting the number of picture that show boys and those that show girls;
  - Describing and comparing the types of roles in which the boys an girls are depicted in the pictorial illustrations in the book.

- Try to reverse the roles of the boys and girls in the pictures.

- Try to balance the language and pictorial representations in your ow lessons, examples and exercises.

1.2 Gender Issues and Assessment and Evaluation

The curricula and other educational materials usually indicate methods and types of test items for assessing the learners. The use of various approaches and methods is vital as these are then likely to cater for the differences in the learners, including academic potential and gender differences. It is important to note here that the examinations greatly influence the actual implementation of the curricula. In other words, teachers teach the content that is likely to be examined, using methods that help the learner to answer the questions correctly. On close examination, the current methods and content of the tests and examinations may favour boys more than girls. The issues can be considered from at least three perspectives as follows.

1.2.1 The Type of Questions

To date, many countries set tests/examinations that require the lowest levels of cognitive abilities, namely the recall and understanding of knowledge, and very few items requiring the higher cognitive abilities of application, analysis, synthesis and evaluation. The usual memorisation types of questions include the statement of theories and principles, giving definitions and processes, and nomenclature. Such question items may be a disadvantage to students particularly girls, who often have no time to cram stuff due to heavy daily chores, both at home and even at school. Therefore question items that require demonstration of understanding, application and the higher reasoning type of questions may be more appropriate.

These are question items that for example:

a. Start with, " Why----?" or ask for explanations;

b. Require the respondent to suggest, judge or decide on something giving reasons for their suggestions, judgement or decisions;

c. Call on ones creativity and initiative to design or develop something;

d. Require one to test hypotheses, or feasible explanation for observed phenomena.

These types of divergent questions help to develop the learners' capacities and abilities to apply knowledge, analyse and synthesise new knowledge, judge the worth of information, and hence be able to solve problems. They are therefore desirable not only for girls but for boys too. It should however be noted that these types of questions demand that the teachers are widely read and keep up to date with information and knowledge. They will then be in a better position to comment appropriately as well as mark students' work with confidence.

IDEAS AND SUGGESTIONS

- Make conscious efforts to ask questions (written or oral) in class that require the learners to apply, analyse, synthesise and evaluate knowledge.

- Students should be encouraged to comment, modify, and correct other pupils' verbal answers. Many of the girls will need special and persistent encouragement initially, in order to participate actively.

- Set test/examination items that require reasoning and encourage suggestions, innovation and creativity.

- The marking scheme for the high order type questions should not only reward correct answers, but it should also have a few specific, "bonus" marks for any brilliant but relevant yet unexpected ideas that learners may come up with in their answers and for creativity. If made aware of the possibility of such marks, many learners will be encouraged to strive to achieve highly.

EXERCISE

- For each of your teaching subjects, develop at least two test items in each of the categories of questions given in a-d, above.

- Make a comprehensive marking scheme for each of the questions.

- Administer some of the questions to the class and mark them according to your marking scheme.

- Develop at least 3 higher order types of questions for each lesson you teach. You will soon have an item bank of good desirable questions.

1.2.2 Continuos Assessment versus Final Examination

The learners need to be continuously assessed throughout the course. This assists them to find out the weak areas and work hard, seeking assistance to improve as the course progresses. The final performance is therefore either the sum total of the continuous assessment scores or a percentage from continuous assessment and a final examination. This way of assessment results in a much more valid evaluation of the individual's abilities and potential than the one-time three-hours type of examination. It is advantageous to learners, especially girls. This is because final examinations can easily coincide with a time when a girl-child is not at her best academically due to the many responsibilities, issues and situations that cause her worry and anxiety. These include the monthly menstruation, the anxiety of caring for siblings and/or the sick and aged, the participation in rituals and economic endeavours at the household levels. Continuous assessment is likely to result in a more fair assessment for such students than the one examination at a given specific time.

However, it is important to caution that this form of assessment does introduces an element of subjectivity in the evaluation, which could be abused by the teacher.

EXERCISE

- Prepare 2-5 written questions of the type that requires reasoning, for each of two lessons taught recently.

- Prepare 3-5 questions for each of the lessons you plan to teach. Endeavour to mark and score some of these questions.

- Examine the class at the end of a major topic or theme, and score the test.

- Combine the results of the short tests and the examination for each student to give the overall performance of the student in this particular topic/theme. This is the gist of continuous assessment.

1.2.3 The Holistic Approach to Assessment

Traditionally, assessment items tend to concentrate only on the cognitive domain (the mind) and both the affective (the heart) and psychomotor (the hands) domains are hardly ever assessed. This is possibly because these two domains are not so easily assessed using written tests. Despite this draw back, it is important to assess and encourage the development of all three domains, for the holistic development of the individual. Furthermore, the abilities in these domains are greatly entwined with those of the cognitive domain. For example, if one has interest in a subject, they are likely to work hard at it, read more on their own around it and hence perform better in tests and examinations. When a learner is comfortable manipulating the materials and apparatus in science, they develop confidence and interest and hence work hard to perform better. More over, if a learner realises they are good at

one aspect, they are easily encouraged and convinced to try and improve in other aspects.

The importance of this holistic development and hence corresponding assessment and evaluation is now being underscored and hence there are more efforts to devise means and ways of assessing all the three domains.

For example, close observations like the following can be used to assess pupils' attitude to practical work:

a. How punctual are they for the practical classes?

b. How quickly do they settle down to carry out the work?

c. To what degree are they neat, fast, accurate in setting up the apparatus and accomplishing the tasks?

Similarly, pupils' general attitude or interest in STVE may be gauged through observing things like:

a. Who tends to read ahead and around the topic being discussed in class?

b. Who asks what type of questions in class?

c. Who attempts all questions and seeks to improve their performance?

d. Who participates actively in class?

The reliable assessment of the psychomotor domain requires one to observe learners as they carry out specific hands-on work. One can then observe the precision rather than overall accuracy of their results; the precautions they take to minimise errors; and the steadiness with which they connect the apparatus and work with materials.

The holistic type of assessment is a major change from the usual assessment and will therefore not be easy at the beginning. However, it is worth a try because it is good for the balanced development of learners. It is further likely to motivate those who appear generally weak academically and the majority of these are usually girls. Their encouragement to perform better can start with the development of their interest in the subjects and identification of specific talents they might have in other areas.

IDEAS AND SUGGESTIONS

- Assessment of the affective domain includes assessing personality, values, likes and dislikes and general behaviour.

- It is important to assess performance and encourage the development of individual talents and abilities in areas such as sports, music, drama and craft, rather than only in the purely "academic" line.

- Pupils who seem to have special talents in areas such as sports, music, drama, debating, and craft can be identified with the help of the respective teachers. It helps to point out to them the specific aspects of their talents that can facilitate their academic efforts, like patience to exercise so as to achieve perfection.

- The students themselves can be involved in initial identification of talents, general attitudes, values and behaviours of peers.

EXERCISE

- Develop an Assessment Card including all the major areas such as Academic Performance, Personality and Co-operation with others, General Behaviour, and Special Talents. Try filling in this card for a few students.

- With time and practice, fill in the Assessment Card for all pupils in your class.

- Summarise the Assessment Card for each student into short comments that can be put in the usual student's report. Try to point out the best in each student.

1.2.4. Participatory Evaluation

This is the involvement of candidates in their own assessment and evaluation. This approach is not very feasible with examination-driven systems and with large classes such as those in many developing countries. It is however now becoming recognised as vital for effective learning and development. This is because it is fairer to the candidates as it allows them

not only to explain their performance, but also to understand the criteria used in the assessment and how they are applied. The learners are then likely to easily accept the evaluation and positively act on any suggestions for improvement. This type of evaluation should therefore be applied where possible, even if it is not used in the final analysis. It is for example useful when discussing the results of "diagnostic" types of tests. These are tests whose sole purpose is to identify the areas where learners fail to perform well, and why, with a view to devising ways of facilitating better understanding. In other words, even if pupils perform very well on a test, the teacher's concern is focussed on the few items they failed and why.

Participatory evaluation can also take the form of learners scoring their exercises and tests. It can be self-scoring and/or random exchange of books for scoring by peers. This not only assist the learners understand how the criteria are applied, but also ensures that assignments are marked with minimum work on the part of the teacher.

IDEAS AND SUGGESTIONS

- Carry out exercises in which learners set test items after some topics/themes and work out a marking scheme for the items set. Let some learners present and discuss their marking schemes with the whole class. Gender differences may emerge.

- Include some of the learner-developed test items in your tests and observe how they perform especially on these items.

- Students' information and data particularly on performance should be gender dis-aggregated. Any significant differences should be investigated to find out the causes and possible solutions.

- Students' test performance should be critically discussed with them, allowing learners to give reasons for their performance. These reasons should be noted and where possible taken into account in the teaching and setting of tests.

EXERCISE

1. Set a short test and critically analyse the performance in terms of how many boys and girls have scored at different score categories, such as the top or lowest 10%, those scoring between 50-60% etc, as appropriate. Is there any gender pattern? In other words, how are the girls generally performing relative to the boys?

2. Analyse the results of several tests more deeply in terms of the type of questions that pupils tend to fail and do well. Do any gender patterns emerge? If so discuss with the students to try to identify the causes for the observed differences with a view to eliminating them.

3. With the participation of the students, try to identify those methods that seem to have most students actively involved and interested, particularly the girls.

1.3 Concluding Thought

Currently, a lot of the STVE curricula and other materials are gender biased. They tend to encourage boys' participation and performance, while psychologically discouraging that of girls. Unfortunately, curricula and other educational materials such as textbooks, reference books, charts etc. are not so easy to change. In fact it takes a long time before any of these materials get revised because of the expenses involved in the revision.

However, given the above discussed information and knowledge on the importance of gender-inclusiveness in these materials, you as individuals and groups of concerned stakeholders, could endeavour to develop supplementary gender-inclusive materials. This is "School-based" curriculum development. It is most desirable because it involves the key implementers of the curriculum, namely, the teachers. It should also be emphasised here that the learners can be involved in the development and production of some of the supplementary materials as part of the usual lessons. The learners can for example come up with activities in their daily experiences that the teachers can build on in the classroom; they can collect and bring materials from home for use as specimens or demonstrations; they can make some materials and draw pictures and charts, working with the teachers.

Having applied some of the ideas discussed above, the chances are high that you would eventually observe some improvement in girls' interest, participation and performance. It is a well-established fact that when given a conducive, encouraging educational environment, girls and women have the potential to perform as well as the boys/men in all fields of endeavour, including STVE. If done well, all these efforts will improve the performance of the boys, too.

Lastly, the new materials and processes developed should be shared widely, revised as necessary after trial, and efforts to get them eventually mainstreamed should be made.

CHAPTER TWO

TEACHER EDUCATION

2.0 The Vital Role of School Teachers

It is widely accepted that teachers have a crucial role to play in the education of a child. It is also obvious that teachers will remain the major vehicles of education, at least in the developing countries, for a very long time to come. Furthermore, the learners spend quite a substantial part of their time in schools and with teachers. More over, the teacher tends to be listened to by learners much more seriously that any other category of people, including the parents. This is particularly so with the young children at the primary and even the lower secondary school levels. The impact of teachers, therefore, on the thinking, practices and attitudes of the learners, is great. Teachers are among the first direct role models of the child, outside the family. They are furthermore, the most easily available and accessible role models for all learners, both boys and girls, for while many children particularly in the rural areas take time before they ever see an.engineer, scientist, or even a doctor, all children see teachers everyday. This is true even for those children who are out of school since primary schools are the most numerous institutions in any society. Consequently, what teachers say and do is very important because it greatly influences the thinking, the actions and the aspirations of children.

Unfortunately, studies have shown that the way teachers teach can be extremely discouraging to learners, particularly girls and women. This is in terms of three major aspects, namely, the actual content taught, the methods used by the teachers and the classroom atmosphere created together with the practices and norms of the classroom.

It is vital that the teachers are trained appropriately, and hence this chapter which discusses teacher training issues. This chapter highlights only those areas that need to be introduced and/or emphasised in the training of teachers so that they can in turn help to eliminate gender-related problems and issues in the classroom.

2.1   School-Based Curriculum Development

The preceding chapter discussed the need for revision of gender-biaised syllabuses, content and test-items. Due to the heavy work and cost involved in curriculum development, however, this process does not happen frequently. However, curriculum can and should be developed or adapted at the school levels by the teachers, through the development of appropriate

supplementary materials. Therefore, the teacher-trainees need and should be assisted to develop these skills during the pre-service preparation programmes. This could be done by experiential learning through developing materials in order for the teacher-trainees to be able to "do/teach as they were taught". It is vital that the trainees prepare and produce instructional materials for actual topics in the syllabuses. It is equally important to document the process of development of these materials, including details of the organisation, logistics and environments that seem to have facilitated the work. It is these processes that have been found to "work" that will be most useful to others when they try out similar things elsewhere, particularly in the schools.

In-service training courses should also have a major component of curriculum development, so that the teachers can update and improve their knowledge and skills. In addition to these courses, curriculum development can be carried out at the school level, if the teachers are committed and interested in improving the learning process. This approach has been initiated in a few schools in Uganda under the FEMSA project. The teachers of a given subject work together to identify difficult topics at a given class level, and then develop teaching strategies, materials and practical work for the identified topics. The project then identifies appropriate experts in materials development to hold workshops for the teachers, so that together they can improve on what the teachers have produced. This approach is good in that the teachers can immediately use any materials and ideas from the group meeting and keep on improving them as they test them in real classroom situations. It is certainly much more cost-effective than externally organised in-service training courses, and, the students can easily be involved in the process.

2.1.1 Appropriate Gender-Inclusive Content

In order to sustain participation, facilitate understanding, as well as improve performance, the content needs to be relevant to the experiences and needs of the learners and society. Both boys and girls must be able to find it interesting and useful in their immediate lives and experiences. The content should as far as possible not only be sequenced but also taught such that the old wisdom of teaching from the "known to the unknown" is always the guiding principle. Consequently, a lot of the current curricula which are gender-biased should be improved through the development of supplementary materials along the lines outlined in chapter 2. However, the skills and commitment to carry out such an exercise have to be inculcated during the teacher preparation programmes, particularly at the pre-service training or preparation of teachers.

2.1 New Content

The new trends in science and technology (S&T) education today premised on the provision of S&T for all, inevitably require that new relevant content be introduced into the STVE curricula. The content can no longer be exactly the same every where in the world because it has to respond to the needs and aspirations of the learners which differ from place to place. It has got to be both environmentally and culturally responsive if it is to be relevant and interesting to the learners. Notwithstanding, the content must also address the aspirations of the learners, the community, and the nation at large, and therefore needs to also be forward-looking. Moreover, learners also need to be equipped with skills for survival and active participation in the scientifically and technologically driven world of the 21st century. Consequently, while old content has got to be re-organised to cater for the wide range of abilities of the learners, new content has also got to be developed to cater for major new considerations. It is such considerations that have resulted into the current need to include content areas such as environmental education, ethics in science and technology, and information science. In developing such new content, it is important that any gender perspectives of the issues are put into consideration.

2.2.1 Environmental Education, EE

The world today is undergoing serious environmental degradation, ranging from the destruction of the ozone layer and the "Green House Effect" in the developed countries, to the deforestation and soil erosion in the developing countries. There is therefore need to include environmental education in the STVE curricula. This should make learners not only scientifically and technologically literate, but also environmentally literate. They can then protect and preserve the environment better for future survival. This area of study is not only vital, but may prove to be quite interesting and attractive to the female learners in particular. This is because in many developing countries, the women are still very intimately linked to the environment through their stereotyped traditional roles in the home. Such roles include collecting firewood, farming and treatment using herbs and other traditional medicines.

2.2.2 Health and Nutrition Education and Promotion

Health and nutrition education is also recommended to be included in STVE curricula, based as they are on similar aims and pedagogical principles providing knowledge and skills to improve the present and future well-being of all. Health and nutrition education is essential for learning and cognitive ability, and as environmental education, the issues are closely related to the daily lives of girls and women.

2.2.3 Ethics and Science and Technology

There is a growing realisation that S&T have both positive and negative effects. The limits and effects of S&T have got to be known so that the consumers can make well-informed decisions about the use of S&T. For example, there used to be many herbicides and insecticides that have a component which can destroy the ozone layer. Today, however, alternatives that are environmentally friendly have been made. Similarly, there is need to develop alternatives to polythene bags. These are very widely used in many countries but their disposal is a problem because they are not biodegradable, meaning that, the natural rotting processes can not decompose them. It is now clearly known that, while S&T is vital to the future survival of human kind, it can and is already being used negatively, with very devastating consequences. This presents a big dilemma and needs very literate citizens to be able to direct the appropriate growth and development of S&T, nationally and globally. For example, while genetic engineering can be put to very good use in increasing crop yields or preventing diseases in crops and humans, it can also be used for cloning and the effects of this could be disastrous. Similarly, while factories produce a variety of goods for human use and comfort, a lot of natural forests and swamps are being destroyed in the process, all in the name of development. Furthermore, the emissions and effluents of such factories also often pollute the air, the land and the water. The trend in science education today, therefore, is the teaching of the ethics of S&T, and content has to be developed accordingly, using local examples where possible.

2.2.4 Information Science and Technology

In view of the "Information Era" and globalisation that we are all inevitably part of wherever we are, it is vital that learners are equipped with appropriate corresponding knowledge and skills. For example, the large volumes of new information in S&T that are being discovered and developed require that learners must know how to acquire this information as quickly as possible and apply it appropriately. Therefore, despite the fact that many of the developing countries may not have the modern S&T widely available elsewhere, efforts have to be made to familiarise learners with it in preparation for their future in the global world. Therefore the challenge is for instance, to equip learners with some knowledge of computers, e-mail and Internet, in a society that is generally far from acquiring these gadgets and services.

It has been noted that while females appear to use computers, they may soon be left behind even in this field. This is because women tend to use computers for the basic functions of word-processing and e-mail and hardly for the more challenging functions of the search and analysis of information,

and the generation of new knowledge. Girls in school therefore need special encouragement in this field too.

Teachers' pre-service and in-service programmes have therefore got to help teachers acquire some of the basic knowledge and skills in the emerging new fields so that they can in turn, build upon this in their interactions with the learners at school.

IDEAS AND SUGGESTIONS

- The content needs to be relevant to the experiences and needs of both the female and male learners and society. Students can discuss some of the activities and work that they do and tease out any STVE content in there, for further development.

- Find out the different customs, beliefs and practices of the learners that might affect girls' effective participation and learning in STVE. You can develop content and gender-sensitisation materials around these too.

- Environmental, health and ethical issues of S&T can easily be incorporated into existing curricula at the school level, by teachers, if they are equipped with the knowledge and skills of developing and teaching the appropriate content, as well as convinced about the importance of including such contents into the syllabuses.

- Carry out deliberate discussions of some new technologies that are available in the country even if they are not so readily available to the school. Endeavour to organise a field visit for the students to see some of these technologies.

EXERCISE

- Carry out exercises on the development of gender-inclusive content similar to those given under 1.1.1.

- Think of one of your own beliefs, custom or practice that may affect th teaching/learning of STVE, and analyse its possible effects on the femal and male learners. Check out your ideas with your students, then write up and share your findings. Repeat this exercise regularly.

- Identify an environmental or health problem in your locality. Identify any gender perspectives to the problem.
    - Develop gender-inclusive content that could be taught on this issu and decide on the topics in the existing curricula where it could best b incorporated.
    - Identify the ethical issues and/or dilemmas that may be related to th problem
    - Design a lesson plan, for teaching some of the content using an appropriate methodology.
    - Develop a few question items to test the understanding of the environmental or health problem, and make a marking scheme fo each of them.
    - Teach the lesson and mark the questions.

- Let your class carry out in small groups, an exercise similar to what you have tried out in no. 3 above, and have each group present its work to the whole class. Let each group carry out an actual peer-teaching lesson o their chosen topic.

3.1 Teaching/Learning Approaches

The recent FEMSA research showed that the classroom approach to the learning of SMT at the primary and secondary levels is often almost entirely didactic in many developing countries. It comprises mainly of a lecture, followed by note taking, and question and answer sessions. Quite often there may be a shortage of equipment and consumables. However, this fact notwithstanding, there was, in general, hardly any practical work being done in the schools. The lecture method is almost invariably the only method commonly employed in teaching at both the primary and lower secondary levels of education. The development of a scientific way of thinking and of inquiry is abandoned and instead, SMT is taught as facts in terms of definitions, laws, theories, nomenclature and standard processes and procedures.

Unfortunately, today it is no longer reasonable to expect the reproduction of facts given the ever-increasing volume of S&T knowledge. The rate at which new knowledge is being discovered and/or created is so fast that many "facts" could be easily rendered untrue in a very short time. The current trend in science education therefore is that learners are taught "how to learn" rather than taught facts. This means that science has to now be taught more as a process rather than a product, and hence the needs for a corresponding change in the methods of delivery.

2.3.1 Inquiry-based Learning Approaches

These approaches entail guided discovery through investigations and experimentation to lead to the learning of concepts, principles and theories of S&T or STVE. Learners must be taught using a lot of practical, inquiry type work. The classroom methods of instruction must therefore shift from the lecture type that is currently the major method of instruction in many schools particularly in Africa. Methods such as discussion, project, and individualised instruction must be employed by the teachers so as to inculcate and develop skills and the ability to learn. These are methods that utilise and build upon ones knowledge and experiences, and hence ones culture and general environment.

2.3.2 Learner-Centered Approaches

Traditionally, classroom methods have almost invariably been teacher-centered, with the teacher seeming to "know it all", and passing on knowledge and information to a usually passive group of learners. What is needed and required now is the active participation of the learners in the discovery and construction of knowledge. The teacher should and can no longer be the sole source of all information and knowledge. The individual must learn how to search and critically analyse knowledge, data and information for themselves. This approach therefore requires that the role of the teachers change from that of instructors to that of facilitators. It further encourages learners to co-operate rather than compete with each other, and hence calls for more of group work and discussion among the learners as well as between the learners and the teacher.

2.4 The Major Teaching/Learning Methods

In the past, STVE, particularly science was for the elite minority of the very few and very bright students. The lecture method could therefore be adequately employed to teach such students. Today, STVE targets all students. Given the differences in the abilities, learning styles and interests of learners, teachers must employ a variety of methods in their teaching. More over, as outlined above, it is the inquiry-based and learner-centered

approaches to teaching/learning that are now found to be more appropriate. There is therefore an urgent need to put emphasis on the knowledge and practice of a wide variety of instructional methods at the teacher preparation level. The teacher trainees need to acquire not only the knowledge and understanding of the different methods, but also the confidence to employ these methods and apply them appropriately in their own teaching. Teacher-educators therefore need to train using the wide variety of methods that are known. This should increase the chances of the teachers "to teach as they were taught".

The choice of methods include the following:

1. The "Lecture" Method, or "Frontal Teaching" or "Talk and Chalk;
2. The Discussion;
3. The Demonstration;
4. The Project Method;
5. Field Study or Study Trip, or Educational Excursion;
6. Simulation and Gaming or Role Playing;
7. The Assignment Method; and,
8. Exhibition, or "Clarifying the Educational Environment".

All these methods can be appropriately used, usually in combination, to ensure that all learners are catered for given the differences in abilities and preferred learning styles. For instance, some people learn best when "seeing", referred to as "visual learners" and hence methods like demonstration, exhibition and field study would be necessary for them; others are comfortable with abstractness and therefore would learn equally well through the lecture and individualised assignments methods. It is further estimated that after some time, most learners tend to remember:

> Very little of what they hear or what they read;
>
> A bit more of what they hear and see;
>
> About 50% of what they say;
>
> Over 80 % of what they say as they do.

Such estimations illustrate the need for properly guided and supervised small group "hands-on" and "minds-on" work, to ensure that learners can discuss as they do the work. This implies that teachers should not organise practical work for pupils and then "leave them to it" as is the common practice in schools. Teachers should instead go round giving individual/group tuition in

the form of questions that force the learners to think critically and discuss what they are doing.

Three points could be emphasized. Firstly, that the choice of an appropriate method is guided by factors like the nature of the topic, the time and resource materials available, and the nature of the learners in terms of their experiences. Secondly, that many of the "experiments" that are often in many of the traditional text books may not necessarily be thought-provoking but recipe-type work that one can do by simply following instructions without much thought. As such therefore, they are "hands-on" but "not minds-on" work and hence not very useful in developing critical thinking skills. Such exercises must therefore be modified and new, truly investigative exercises developed by the teachers. Thirdly, the teachers must be comfortable with the different methods of teaching. Only then will they employ them appropriately, creatively, and improvise accordingly, where necessary. The teachers therefore need to be trained in these skills.

2.4.1 Gender-Inclusive Methods of Teaching/Learning

Today the trend of "Science and Technology Education for All" targets every body. The methods of teaching employed must be such that they create interest and encourage participation and hence learning, of every body including girls.

There is some research and anecdotal evidence to suggest that unlike men, women may be more comfortable and responsive to instructional methods that foster co-operation rather than competition. This may be so because of up-bringing, particularly in Africa, where as home makers and people who provide care for society in general, women are often trained and encouraged to tolerate and co-operate with others and share resources. Therefore, involvement in discussions and group work, leading to co-operative rather than competitive learning may encourage girls' participation more.

Furthermore, inquiry and learner centered methods as indicated above, are likely to encourage better participation and performance on the part of all students but most specifically the girls in Africa. This is because, many girls in Africa often go to school after performing a lot of chores at home, and hence they are quite tired even early in the morning. Therefore, they are likely to loose concentration and fall asleep when methods such as the lecture method which allows them to be passive, are employed all the time.

EXERCISE

- Referring back to the most recent lesson you have conducted in each of the classes you teach, outline at least two other methods you could have used, and in each case clearly outline the materials you would need.

- Make a lesson plan for the same lesson using each of the alternative methods suggested in 1 above, and critically compare the lessons in terms of :
  - Which lesson is likely to create more interest and active participation of the pupils in general and girls in particular and why?
  - What are the major advantages and disadvantages of each method.

- Try teaching using each of the methods in an appropriate situation, after careful preparation, and again do the comparison as in no.2 above.

- Continue identifying appropriate opportunities to try out different methods, identifying their strengths and weaknesses as you employ them in your subject and classroom. Keep a record of your findings and share them with colleagues.

2.5 Awareness of Gender Issues in Education

Many teachers are not aware of the gender issues in education in general and STVE in particular. They are not aware of the special difficulties that girls face in the learning of STVE subjects. It has therefore become very important

that teacher education programmes include modules on gender issues in education in general and STVE in particular. Such modules must discuss as many of the different problems and issues as possible. They could include a component of small research studies so that the understanding of the gender issues by the teacher trainees is increased and deepened.

2.5.1 Issues of Education in General

There are a number of factors that have been found to affect girls' enrolment and continued participation in formal education. For example, recent research studies in Africa have shown that many people, cultures, and hence societies do not highly value girls' education. Consequently, they do not want to send girls to school, and particularly so when they have to sacrifice quite a lot to pay fees. They do not see the need for girls' higher education, because in their minds, a girls'/woman's place is still in the home and kitchen. It should be pointed out here that "higher" education could mean education above primary 4 level! Parents therefore easily withdraw girls temporarily out of school to do household chores, take care of the sick, or carry out petty trade to improve household incomes. There are still very many who would withdraw the girls completely from school for early marriage.

Poverty is a major factor too, when it comes to girls' education in developing countries. When faced with little resources for basic needs like food, shelter, clothing and health, education becomes a luxury and particularly so the education of girls! Even if the education of the girl is appreciated, parents/guardians prefer to educate boys to girls for several reasons. First, many people still believe that the boy is the future "bread earner" and should therefore be educated in order to get a job, while the girl does not need education, as she would be provided for by her future husband. Secondly, many parents unfortunately still see education primarily as an investment for their own future, rather than a basic responsibility that they owe to their children. The education of a girl-child is therefore still perceived as not being beneficial to parents because the girl would be "lost" to another family on marriage and hence she is not worth educating. Thirdly, the risks of educating a girl are much higher than those of a boy. The girls are easily enticed or harassed out of school, and many drop out of school because of pregnancy or poor performance due to a host of reasons. Hence they educate the boy who is more likely to complete school than the girl.

2.5.2 Issues Specific to STVE

The greatest majority of people, teachers included, is insensitive to the problems that girls must experience in the study of STVE. For example, the stereotyped gender roles imply that girls have different out-of-school experiences from those of boys. Unfortunately, the current STVE content in

most developing countries particularly in Africa builds more on male than female experiences. This distances the girls from these subjects as they are made to appear irrelevant to girls' immediate lived experiences and needs.

The teachers further fail to take into account the anxiety that many girls must experience during the beginning of the study of STVE. For instance, the recent FEMSA studies in Uganda revealed that some girls experience a lot of anxiety when topics such as hygiene and reproduction are discussed in the classroom quite often at a time when girls are experiencing their first menstrual periods. This is because the girls often lack the appropriate information and are therefore uncertain of what is happening to them and how to cope with the changes of puberty. An apparently simple but very common practice of requiring pupils to stand up to ask or answer a question would cause a lot of anxiety to menstruating girls. They would be most unwilling to stand up, and would avoid this by not raising their hands up. They would hence appear destructed and uninterested, and may be ignored by many teachers. While more research needs to be done in this area, girls in this period may psychologically close their minds to anything that alludes to the causes of their mental or physical discomfort, and hence miss out on the learning during those periods.

Given the relatively more "protected" up-bringing of girls compared to boys in many cultures, the girls are also likely to experience anxiety when asked to use unfamiliar equipment and apparatus or cope with live specimens in science lessons. For example, most boys in the countryside would have observed a lot of nature in the wild as they play such as watching birds hutch, snakes shading their skins etc.; and it is the boys and not girls who slaughter animals for food in many cultures. Consequently boys are likely to be more at ease when examining live specimen or dissecting frogs in class. The girls on the other hand, would have to "psyche" themselves up before even touching the specimen, let alone dissecting it! The girls therefore appear less willing to participate and perform poorer than the boys do simply because, the teacher would have "moved on with the brighter students/boys", by he time the girls master the courage to try and acquire the necessary knowledge and skills.

The teachers also fail to understand when girls, especially from traditional and conservative backgrounds, seem unwilling to enter into discussions or ask questions, especially in mixed classrooms. In many cultures in Africa for instance, girls are trained not to question anything or show curiosity, and yet these are traits that are useful in the study of STVE. Such girls would appear uninterested, less bright and capable than boys, and end up performing badly and dropping out of STVE.

Another factor that affects girls' performance in STVE is the unfortunate issue of sexual harassment. Many girls will fear to seek help and assistance from

the usually male teachers of STVE and/or their male peers, for fear of being sexually harassed in the process. The result is poorer performance and dropping out of the course. There is also an aspect of this evil that may indirectly affect the boys too as well as other girls. This is when academically competent students both boys and girls, may be relegated while weaker girls who have sexually surrendered to a teacher receive higher marks in return, and hence get ranked more competent.

The above discussion illustrates the need for teacher education programmes that sensitise teacher-trainees to all these salient gender-issues in STVE. Such courses should not overlook any issues that would negatively affect boys.

2.6   Gender-Biased Classroom Practices

A lot of gender-biased classroom norms and practices have been observed but most teachers are not even aware that they treat girls differently from boys. The differential treatment ranges from the usual stereotyped roles like girls cleaning the class and the black board, to the more psychologically damaging practices such as boys being asked to take on more of the leadership roles and the academically more challenging roles like working out examples on the black-board. In fact, the whole classroom environment is often quite unfriendly to the girl child. Research findings from elsewhere and recently from the FEMSA project have revealed that male and female learners are treated differently by the teachers, irrespective of whether the teacher is female or male. In other words both female and male teachers need sensitisation and training in gender issues.

Below is a discussion of some of the major areas with regards to classroom norms and practices, where gender biases have clearly been observed.

2.6.1 Questions and Assistance

Teachers have been found to direct many more questions to boys than to girls. Furthermore the questions directed to boys are usually those requiring reasoning, explanations, and suggestions while girls often get questions that do not require much thinking, but demanding the recall facts, like stating definitions, laws and principles. It should be noted here that by virtue of the types of questions asked, the boys get assisted to answer because the teachers tend to rephrase the questions and/or give clues and queues that help the boy to answer correctly. On the other hand it is difficult to re-phrase a question that asks for a definition or a statement of a specific law. The result is that the boys appear to be more intelligent than the girls are because they tend to give correct answers more frequently than girls do. In addition, boys get more individual attention and assistance from the teachers during class

than girls. This is not just because boys also tend to be more aggressive and ask for assistance more than girls do. It has been observed that as teachers go round during an individual class exercise, they talk to more boys than girls, giving them individual tuition as they correct the pupils' work. This certainly develops confidence in the boys, while the girls feel left out and therefore easily give up trying.

2.6.2 Teacher Expectations

When a teacher asks a question, it is important that the respondent is given ample time to think about it and then answer. The time that the teacher allows the student to try and answer before directing the question to another person is called the "wait time". It has been observed that the "wait time" is usually longer for boys than for girls. In many cases the teachers would have moved on to the next person, usually a boy, before the girl would even get up to try and answer. In fact one can even hear teachers who after directing a question to a girl, almost immediately add something like, *"can we have a clever boys help Mary out please"*, or *" John, can you help Mary answer the question while she tries to get up from her seat"*. Such teachers do not expect much from the girls and so they feel *they "should move on quickly, instead of wasting everybody's time"*. I believe that having observed this inclination of teachers, girls who do not want to answer questions would deliberately shuffle out of their seats very slowly so that the teacher can pass on the question to someone else.

Teachers further directly demonstrated that they expect the boys to perform better than girls. For example, a teacher would be quite pleased with a bright girl scoring 65%, praising her with, *"excellent performance, Mary"*! On the other hand however, the same teacher would scold an equally bright boy for scoring 85% with *"you should have done a lot better than this, John"*! This psychologically "brainwashes" both boys and girls into believing that boys are by nature brighter than girls, and with time boys will tend to work harder while girls will unfortunately put in less effort, so as to "meet the teacher's expectations".

2.6.3 Active Discouragement

Apart from the above discussed indirect ways of discouraging girls from effective participation in STVE, today, there are still teachers who directly and openly discourage girls with utterances like, *"Mary, do not bother your pretty little head with mathematics, these subjects are not for you/girls"*. In other classrooms, the teacher may not make such a statement, but instead act it by allowing girls to sleep through the lesson without any efforts to wake them up and engage them actively in the lesson. With such utterances and practices girls eventually believe that they cannot perform as well as boy in these

subjects. They then live to these expectations and particularly so since they get similar verbal discouragement from their parents, peers and society at large.

Another side to this aspect is the harassment and discouragement from male peers that girls experience daily without much protection from the teachers. This ranges from murmurs or making noise with the feet when a girl tries to contribute in class, to rude jokes and similar verbal abuse. Many teachers fail to recognise this aggressive behaviour of boys for what it really is and hence fail to protect the girls. The girls will therefore try protecting themselves by shutting up and being passive in class. The girls will consequently loose out and fail to perform to their level best.

SUGGESTIONS AND IDEAS

- Let students discuss their own past experiences at school regarding the possibility of differential treatment between boys and girls in class and at school in general.

- It is important to carry out empirical research into the STVE learning environment, so as to improve ones understanding and appreciation of the issues.

- Practical solutions towards removing the gender-biases in classroom norms and practices should also be discusses and tried out.

- The students can be involved in the identification of gender-biased practices and possible solutions.

EXERCISE

- Work with one colleague, such that you observe each other teach and identify any biases in the classroom, particularly gender-biases.

- Together with your colleague and others if possible, develop an instrument for observing gender-biases in a classroom.

- Use the instrument to identify more biases and discuss what can be done to overcome them. Try out the suggested solutions.

2.7 Concluding Thought

Society, through the different cultures, has trained both boys/men and girls/women differently, and "brainwashed" many into believing that the girls/women have less potential than boys/men, particularly in the STVE fields. Therefore, the content, learning materials, teaching/learning approaches and methods, and classroom norms and practices are all geared towards encouraging the participation and success of the male learner only, and tend not to cater for the female learner. This has to be corrected, such that the female learners are equally tergeted.

Males and females may learn differently given that gender roles and up-bringing shape them differently. It is therefore important to look out for any differences and deliberately take them into account as you interact with learners. However, caution must be taken to ensure that in the process, the gender biases are not entrenched instead of being gradually removed.

It is not easy to detect ones own gender biases and insensitivity. It is often a shock to the teachers when confronted with hard evidence that they tend to ignore the girls in class, directing less questions to them and giving them less individual tuition. The teachers must therefore be deliberately sensitised to these almost subconscious biases during their teacher education programmes, both at the pre-service and in-service programmes. They should, wherever possible, try to identify some of these practices themselves through small school/classroom-based research studies. This can be done during the "School Practice" period of training which often forms part of many pre-service teacher-preparation programmes. Such exercises will help convince them of the problems, and hopefully sensitise them more to the need to alleviate them at least in their own teaching. The solutions and strategies identified to remedy the situations should similarly be tried out.

It should be emphasised here that gender-biases are entranced over ones lifetime, through social-cultural beliefs, norms and practices. The necessary change to gender-equity should therefore not be expected to happen fast because it involves a change of attitudes. Therefore, a seminar or workshop here and there is not likely to up-root these deep-seated, quite often subconscious attitudes. Programmes that are systematic and regular are necessary, particularly for the teachers, given the vital role they play in the education of any learner. Therefore, all in-service teacher training programmes should also contain modules on gender-issues and how to achieve gender-equity in the classroom, drawing on the lived experiences of the teachers and pupils.

CHAPTER THREE

GUIDANCE AND COUNSELLING

3.0   What is Guidance and Counselling

Guidance is the giving of advice to someone according to what the guide considers to be good or appropriate given his or her presumably superior knowledge and experience. The guide considerably influences the final decision taken. Counselling on the other hand is helping a person make a well-informed decision about their situation, after they have been assisted to critically consider all information and possible options relevant to the situation. The role of the counsellor is to give relevant information and help the client probe deeper so as to understand their situation as well as possible and feasible options, before the client takes the final decision. The person being counselled therefore takes full responsibility for their decisions. The counsellor has to try and create a relaxed atmosphere, where the client or the group being guided or counselled feels accepted and encouraged to express themselves freely.

The recent FEMSA findings showed that the students, particularly the girls, lacked guidance and counselling even for social issues. They lacked information on future jobs and careers, particularly in the STVE fields, and the little they had was full of misconceptions like engineers having to always climb tall poles to do their job! Few would have had of a job like architecture, let alone know that a seemingly removed subject like Fine Art is actually very relevant for such as job. There is reason to believe that the situation is not very different in many other developing parts of the world. While information may be available in the urban areas of these countries, communication is relatively poor in rural areas and yet the majority of the people live there. Apart from this, the information available is often not packaged appropriately for the young people, let alone being the type that is of immediate relevance to their needs and aspirations.

This chapter discusses aspects of guidance and counselling pertinent at the school level, and outlines some approaches and strategies that are often employed in schools.

3.1   Some Major Aspects of Guidance and Counselling

Today the world is changing very fast in terms of available information, life styles, and socio-economic structures. Learners can no longer be guaranteed a white-collar job at the end of their academic qualification in any field as it used to be. They have to be assisted to understand this major change and

guided to choose their courses more wisely and deliberately. Moreover, they need to be assisted to recognise education not only as a means to a job but also as a means to improved standard of leaving. On the social scene, there is a lot of information that people have to sift through in order to make good decisions regarding their future jobs, life styles and health. There is therefore need to provide systematic and comprehensive guidance and counselling to the young people, starting at the primary school level, to help them deal with the fast-changing situations today.

3.1.1 Social Guidance and Counselling

Social guidance to students is a vital component of education, which is often ignored at school. It is particularly vital at the upper primary and lower secondary school levels because it is around this time that puberty sets in and the little girl or boy suddenly becomes a woman or man, respectively. This period of adolescence is very confusing given the physiological changes that one suddenly experiences, and often with no thorough preparation for it. Adolescence is particularly perturbing to the girls since they not only undergo drastic physiological changes but society also suddenly thrusts many responsibilities to them as young women.

First of all, the adolescent girls need to be assisted to understand the physiological changes they experience particularly menstruation, the development of body odour and the enlargement of bust and the bottoms. In many cultures, the girls in particular used to be given some sort of training regarding adolescence. However, the training was geared more towards informing the girl about the societal expectations of her rather than assisting her to understand and hence accept the changes as part of the normal growth of a woman. It included a lot of unfounded taboos and superstitions, and tended not to empower the women, particularly with regards to the reproductive roles and career prospects. Today, many people experience a mixture of cultures, namely, the traditional and the western type of cultures, which are more often than not, conflicting in values and practices. This "confusion" is made worse by the ease of mobility and communication, which makes it relatively easy to obtain a lot of different information on the same subject. The result is that even the traditional "training" of the girls is no longer taking place in many cultures mainly because those who would have done the training are themselves either "confused", or no longer knowledgeable or do not believe in it anymore. Consequently, the young people find themselves with hardly any systematic adult guidance and counselling in social issues. It is therefore necessary that the schools take on this responsibility to fill this vacuum of vital knowledge. In my view, this may also be in the best interests for everyone if it is properly done, because the schools would discuss the issues adequately and objectively, explaining most superstitions and giving the necessary scientific knowledge and information.

The FEMSA research in Uganda for example revealed that many adolescent girls experience a lot of anxiety during science lesson when topics like hygiene and reproduction are discussed. This is quite understandable when the girls are not well informed and /or trained to care for themselves properly. The anxiety is heightened by the fact that most science teachers at this level are men, and men who are not even sensitive to these gender issues. It is therefore important that a programme of social hygiene, social graces and etiquette be developed for inclusion in the school curricula, starting at primary level. The programmes must include the male issues so as to help the boys too. They must put emphasis on social and health issues, which are often inter-linked, starting with those, that are important at the local, national and then international levels. Examples of social/health issues and problems include drinking, smoking, the abuse of drugs, sexually transmitted diseases particularly AIDS, and unwanted pregnancies and abortions.

Secondly, the young people, particularly girls, must be assisted to deal with the emotional changes and self-consciousness about their looks and behaviour that come about with adolescence. This is important because research seems to point to this change as having a major effect on girls' performance. The effect on performance is even more pronounced for STVE subject which are not only hierarchical in nature and hence require regular participation, but also require much more time and serious concentration than others do. The result is that girls, who are at this time pre-occupied with their appearances and relationship with the opposite sex, tend to perform poorly and end up dropping out of STVE courses at the earliest possible opportunity.

Thirdly, and in direct connection to the above, girls in particular need to be helped to understand their sexuality and the sort of over-night change in expectations of society with regards to the girls. In many societies, the girl who reaches puberty is suddenly looked upon as a woman who is not only sexually mature but also able to make adult decision, regardless of the physical age, not to mention the mental age! The girl needs to be assisted to understand why men and even school male peers who have been treating her as a little girl or a sister, suddenly look at her with lust, and begin to sexually harass her. Sexual harassment in educational institutions in not only a serious problem in its own right, but it has very important implications for girls'/women's ability to pursue their studies. Girls/women often study under constant verbal abuse with obscene comments and jokes directed at them. The young girls therefore not only need adult protection from this abuse, but more importantly, they need knowledge and appropriate coping strategies to deal with these and other situations.

3.1.2 Career Guidance and Counselling

Another important factor that seems to affect girls' participation in STVE is the lack of career guidance and counselling in the schools. In the few cases where some career guidance exists, it is neither systematic nor institutionalised. Moreover, it is often given at the upper secondary school level, when it is rather late as students would have made up their minds with regards to pursuing science-based or arts-based courses. Therefore the students lack the necessary information about the range of jobs and careers open to them particularly in the science-bases fields. The lack of information is more acute in the case of girls and for the STVE fields. Unlike the boys, girls neither get adequate exposure since they tend to be overprotected nor see many role models in the STVE fields. They therefore fail to even aspire for such jobs.

There is research evidence that teachers, parents and peers have a great influence on ones choice of field of study. Unfortunately for the girls, most teachers and parents still consciously or subconsciously believe in the stereotyped roles and jobs, and hence tend to "wrongly" advise girls against the study of STVE and hence jobs and careers. Many girls are literary forced to either study or drop science-based subjects and courses by the teachers and parents. In fact, recent research shows that there are still very many parents and teachers who either actively discourage girls from STVE or deliberately fail to encourage and assist them to perform well in these fields. These people need sensitisation as well as career information and guidance. They need to be convinced that STVE is not "a male only" area of study; hence female role models in STVE should be involved in the sensitisation, as "seeing is believing".

There is usually no career guidance of any form at the primary school level, which is unfortunate since learners should be exposed to possible future jobs and careers as soon as possible. They will then have plenty of time to learn more about the careers and hence be able to make well-informed decisions about them when the time comes. In choosing a job or career, one should not only consider one's academic competence, but also one's disposition towards the other requirements of the job. For example, while one may perform very well in the subjects necessary to pursue a course in human medicine, they may not be quite suited to a career as a doctor unless they also like helping people who are in distress. They should be willing to give up their free time to the treatment of people and ready to be called upon anytime whether it is at a leisure function or at night. A person who likes working with people is not likely to enjoy a job where they work with machines and vice-versa. Such a person is likely to fail to get intrinsic job satisfaction, and would be more easily frustrated at the job.

Furthermore, it is well known that interest and high aspiration often lead to a determination to succeed, and hence good performance. For example, if one knows early enough what subjects they need to pass well in order to become a meteorologist or an agronomist, they may, with determination, work harder and succeed where they might have otherwise failed. Otherwise, learners realise too late that they have not studied subject combinations that can lead to their desired career. A case in point was a girl, at senior three level, who wanted to do engineering but hated mathematics and physics and enjoyed history best!

3.1.3 Time Management and Study Tips

Experiences indicate that many students, particularly girls, lack time-management skills and appropriate study strategies and approaches. This must contribute to their poorer performance, particularly in science-based subjects. Many students just happen to go through the day without any deliberate plan of their free time. This state of affairs is not desirable for anyone but particularly at the adolescent stages when the temptation to do unacceptable things seems to be at it's highest. Students need to be assisted not only to realise that there is "an appropriate time for everything", but also to learn to plan and manage their time well.

The concept of time management is often ignored at the school level, possibly because the schools have set timetables leaving the learners with very little free time. Despite this general fact, the truth of the matter is that even this little free time needs to be planned for and managed properly for maximum benefit to the learner. More over, it is at this early stage in the development of an individual that it is good to develop useful skills, habits, behaviours and practices. The learners need to be trained and assisted in developing these desirable practices as early as possible.

Most students usually use a lot of the free time at school for self-study. They need to be helped to maximise the benefits through appropriate study tips and approaches. For instance, while a few students can study quite well on their own, many tend to sleep and/or loose concentration quickly when studying alone. They then get frustrated because they loose out on leisure time yet they do not assimilate much content. Such students would find it more useful to study in a small, well-disciplined group. Within this group, there should be frequent breaks to share and discuss what has been read individually, to avoid loss of concentration and ward off sleep. It is also useful to allocate different questions, small sub-topics or issues to members of a study group. Each member has the task of carrying out an in-depth study of their assignment and then explaining it to the others in the group. This approach has several advantages in my view. First, one is not likely to sleep or loose concentration while working in a group. Secondly, one learns from

peers and peer teaching and discussions have been found to be quite effective. This is possibly because the learners feel freer to get to the bottom of the causes of their lack of understanding while at the same time using the language and jargon suited to their level. Thirdly, by the end of a given study period, each member in the group would have covered and understood several study topics/questions. Fourthly, each member of the group is sure to remember at least the one topic that they had to present, simply because they had to have understood it extremely well in order to be able to explain it properly to all the others. In fact it can be very helpful to assist others to get an in-depth understanding of the issues. Lastly it is often easier to remember what others explained to you when you can also contribute and ask questions for clarification, than what one has read quietly on their own.

Other study tips include the making of brief notes and/or key phrases, equations, issues, etc, on small cards that are easy to refer to anytime. Other people answer several appropriate questions after studying little bits of content to check their understanding. There are yet others who may develop something like clues to a crossword puzzle or concept maps and in so doing help themselves not only to remember, but most importantly, to understand the concepts. Therefore students, particularly the girls, should be exposed to different study approaches and tips, so that they can choose whatever is appropriate to their own learning styles. They will then be able to utilise their time properly and perform better at school.

3.1.4 The Parent-Pupil –Teacher Relationship

Today, the relatively great demand for education has resulted in the fact that the learners spend a lot more time at school than at home. The tendency therefore is for parents/guardians to relax on their responsibility of guiding their children leaving it almost entirely to the teachers. It is however clear that the best benefit for the student is achieved when the teachers work together with the parents to assist, direct and guide the learner. This is particularly so for the girl-child who, because of the "over-protected" upbringing, tends to need more focused attention and guidance in their adolescence than the boy-child. For example, students, including many girls, have been known to leave home yet fail to attend school, without the knowledge of the parents/guardians. The pupils would however find it very difficult to miss classes or play truancy at school if they know that their parents/guardians are in constant contact with the school authorities and teachers.

The relationship between the parents, pupil and teachers needs to be developed very carefully if it is to be beneficial to the child. The parents and teachers have got to get the correct balance between giving in to the child in terms of things he/she want and reprimanding and, seriously but appropriately punishing the child. In other words, there is need to balance the

discipline versus the "love" for the children. For instance, quite often parents fail to discipline the children, fearing that the children may see this as lack of love and understanding on their part. On the other hand, teachers too fear to discipline the pupils for fear of contravening the "children's rights". This situation applies more to the girl-child. For example, the FEMSA-Uganda research revealed that the male teachers fear to discipline the girls, or even give them individual help because this might be mistaken for sexual harassment and the soliciting of sexual favours. The result is that the pupils become undisciplined and/or loose out on needed assistance and guidance, which adversely affects their school performance and future.

Furthermore, there is need to balance the freedom versus the "over-protection" of the girl-child. Rules are often made and punishments given without adequate explanations. The children then fail to see the need and importance of these measures and hence resent rather than accept them as proper and necessary. One should know and understand why they are being reprimanded or punished. Otherwise, it seems like aggression to the less powerful and the young, by the powers that be. It is further advisable to involve the learners, girls for example, in setting their own rules, because then they get some understanding of the basis for the rules and regulations. They can further come up with appropriate punishments for who ever breaks these rules.

3.2 Approaches to Guidance and Counselling at School

In this section, I outline some approaches to guidance and counselling that have been employed and found quite applicable at the school level.

3.2.1 Group Guidance and Counselling

This is where a group of people is guided and counselled by a knowledgeable, often older person. This approach is used for the discussion and dissemination of information on general issues of concern and/or interest. These include the discussion of the different jobs and careers in terms of their academic, practical and personality requirements, social issues such as acceptable behaviours, and social ills at the school level, such as smoking, drinking and drug abuse.

People work together in small groups to understand the issues and, generate and obtain information and knowledge on the topic, under the leadership and guidance of a counsellor. They can then discuss preventive strategies and feasible solutions. An example here is the problem of girls' sexual harassment at a day school and how this affects their performance and continued participation in education. The girls can be assisted to realise the need and importance of education, and the forms and depths of sexual harassment from the teachers, the male peers and the rest of the community

as the girls travel daily to and from school. At the level of upper primary and lower secondary school, many girls are too young to recognise boys'/men's flattery and attention as being potentially dangerous. In fact they often compete for such attention and end up "hating" each other over such matters. Through group guidance and counselling, girls can be assisted to understand the possible implication of such attention, and to work out simple but effective protection strategies. These include, walking home in small groups rather than individually; seeking assistance from teachers when at least in pairs, preferably in trios; identifying responsible and trustworthy persons at school, and in the community; and giving each other support and encouragement to report any forms of abuse immediately.

3.2.2 Peer Guidance and Counselling

This approach involves the guidance and counselling of peers by others of their own age group and with similar experiences. This could be in a group or in a one-to-one situation. It has been found to be quite effective if well done because then the client cannot claim lack of understanding on the part of the counsellor, due to a wide gap in age and experiences. The clients tend to be more forthcoming with information about their situation with peers than with others. However, the "counsellors" have to be not only very well trained, but they must have gained respect from their peers. They need to be assertive and they often happen to have leadership skills and roles.

3.2.3 One-to-one Guidance and Counselling

As its name indicates, this is where one person counsels another. It is applied when there is indication for in-depth analysis of individual situations and problems, and usually requires that the counsellor assure the client of confidentiality. The client must feel hopeful that they will be assisted. Consequently, while in principle the counsellor could be a peer, in reality it is usually either a professional counsellor or an adult who in this case may be directly or indirectly associated with the school.

Whatever the approach, the counsellor must be a person who commands rather than demands respect. They need to be very patient and very accommodating, at least seemingly so until they convince their clients otherwise; and they must be prepared to give the client the time they need to gradually work through the situations and come to a desirable decision. My experience has shown that adults like parents prefer a counsellor who is at least perceived to be an experienced, preferably older adult as opposed to young adults even when they are professionally qualified.

3.3 Some Strategies at the School Level

3.3.1 A Guidance and Counselling Department or Teacher

Schools in many countries are establishing career guidance and counselling units, and creating the post of a career guidance teacher. Many schools are further expand the units to include other types of guidance and counselling particularly on social and health issues and hence creating departments instead of small units. This is due to the realisation that this service is now a necessity given the fast-changing socio-economic milieu and the volumes of information available in the world today. At the school level, the major role of the guidance and counselling (G&C) teacher or department is to provide a systematic G&C programme for the pupils, using relevant approaches. They have to identify, collect and provide appropriate information and materials to help the learners make informed decisions about future careers and other issues. It should be underscored here that both the rest of the teachers in the school and the parents must also be educated and must participate in G&C sessions so that they can guide the children particularly the girls appropriately. This is important because as stated earlier, teachers, parents and peers are very influential in ones values, beliefs, behaviour as well as the choice of jobs and careers.

3.3.2 A Senior Woman Teacher

Many schools have a post of a "senior woman teacher" whose responsibility is to try and help girls discuss and resolve issues and problems that are particularly related to them. This position must have been created in recognition of the fact that girls do experience many sex and gender-related problems and would need a sort of "confidant" to help them grapple with them.

While the "senior woman teacher" concept is good and can serve a good purpose, my knowledge and experience indicate that its effectiveness is hampered by a few major problems. First and foremost, these ladies usually lack any form of training in professional guidance and counselling. The position is often thrust upon them by virtue of their seniority either in the school or in age. They are therefore neither confident nor able to effectively guide, let alone counsel others. Secondly, the incumbents are often such adults that the age gap between them and the potential clients, the female students, is so big that it becomes difficult for the girls to confide in the teacher. In addition, these "old" women are usually so serious and set in their own ways and approach to doing things that they appear and/or tend to become unapproachable, as far as the students are concerned. The girls fear that, for example, their "modern" way of dress or behaviour is likely to be misunderstood and condemned by such elderly ladies. Thirdly, many times

the incumbents lack the assertiveness and social standing and/or status in the school to be able to voice, not to mention getting redress to, any genuine complaints of female students to the school administration. The usual case in point here is the problem of sexual harassment, by teachers and men of influence in the community. Other common examples include the use of abusive sexist language to humiliate the girls, excessive punishments which do not "fit the crime", and the use of girls for domestic work in teachers' homes and/or gardens.

Therefore, the above outlined problems have to be addressed if the strategy of a "senior woman teacher" is to be effectively employed to assist girls out of their problems. This is even more important for the study of STVE by girls, because of several reasons. First, many girls lack confidence in STVE subjects and hence require constant encouragement and assistance from the teachers. The girls must therefore feel safe to seek help and remedial work from these teachers. Unfortunately, it is men who usually teach STVE subjects, and many girls fail to approach them because they either fear being sexually harassment or accused of soliciting favours. Secondly, these subjects are hierarchical in nature and require consistent attendance and hard work. If girls miss classes because of late coming and chores, then they will find it even more difficult to understand and perform well. Similarly, if learners, particularly girls, avoid active participation or miss class for fear of verbal abuse and/or punishment, they will find it very difficult to catch up on their own and hence perform poorly.

IDEAS AND SUGGESTIONS

- Since some parents may be more willing to pay fees and other school requirements like uniforms for boys and not girls, try not to send girls away from school when such requirements are not fulfilled. Instead, ensure that you discuss the issue with the parents/guardians.

- Should you establish that girls come late to school due to home-chores, do not punish or send them away from class. Discuss the importance of promptness at school with both the pupil and the parents/guardians.

- Career guidance and counselling programmes can be in the form of career days per term and/or periods per week. Visits to other schools to see how they organise these, can be a good starting point.

- A specific period per week could be set aside to teach social graces and etiquette. The learners are likely not only to benefit from it immediately, but also to enjoy it.

- Try to identify role models from the local area as these can easily be convinced to participate in the G&C programmes of the school with little expense to the school. The involvement of role models that are natives of the village or area is also encouraging to the community.

- It is quite interesting and encouraging to students to invite former students of the school to participate in the G&C programmes.

- Encourage students to collect information on issues of health, social and career guidance, for example from newspapers and magazines, for sharing with others at school. Give small incentives to good performers.

EXERCISE

- Create a period for your class, on a weekend, and find out how many different types of jobs and careers they know about not only by name or description, but also in terms of the pre-requisite academic requirements and personality traits.

- Carry out some inquiries among your colleagues to obtain facts about the careers identified by your pupils, and meanwhile, ask the pupils to do the same with their friends and parents, if they are day scholars. Then hold another discussion with the students to synchronise your new knowledge.

- Organise a careers period and invite some role models in a few of the identified areas. Invite fellow teachers to the event. Evaluate its impact on the knowledge and interest of the students, the teachers and your self.

- Try organising another careers period on other careers that may not be so well known in the STVE area. This time involve other teachers in the preparation and planning of the event.

- Now systematically try out a similar exercise, on the possible problems that girls may have at school, at home, and on the way to school for day scholars. Remember that this is a sensitive exercise and should be taken slowly, starting with a few less sensitive issues/problems, to develop confidence.

- Solicit the support of the school authorities to plan a G&C programme on the issues identified and to dig deeper for others through small group discussion.

- Identify qualified counsellors who could be invited to the school to provide group and/or individual G&C sessions for the girls.

3.4 Concluding Thought

It is necessary that guidance and counselling programmes are designed for all students, but most specifically the girls. These programmes should further be institutionalised, starting at the upper primary level. I wish to underscore the need to involve the parents and even the general community around the schools in some of these programmes so that they too gain the knowledge and information to assist the young people appropriately. The participation of these two categories is particularly important in the case of encouraging girls to pursue studies and careers in STVE. The parents and general society need to be sensitised to the potential of the girls in these fields before they can be expected to encourage and support girls in STVE.

Female role models must be involved in the sensitisation, training, and G&C sessions. This has been found to be effective in encouraging girls as well as helping to change the negative attitudes of the boys, men, women and society in general, towards girls' education in STVE. It is further important to involve the younger crop of female role models in any G&C programmes. These may not have had a lot of career and other worldly experiences by virtue of their age, or made outstanding achievements. However, the young people in schools identify better with them than with the older group who they feel "may be out of touch with the adolescent reality". For instance, secondary school students can be used in G&C sessions for primary school, under the guidance of a trained person. This not withstanding, the older group of role models has a definite role to play too, by showing what could be achieved with hard work, persistence, self-discipline and motivation.

Lastly, it is important to note that those invited to talk to/with the students need re-orientation seminars before they meet the students. They must be aware of the objectives of the programme so that they do not instead talk down to the students.

CHAPTER FOUR

MOTIVATING GIRLS INTO STVE

4.0 What is Motivation?

Most people are moved into action once they have a reason to do so. The reason may not always be obvious or easily tangible, and this makes it very difficult to define motivation. Given the dictionary meaning of the word, to motivate may be defined as to cause action through some internal self-drive or external incentive. Motivation helps someone to take action that would not have otherwise been taken, or might have taken longer to happen. Most people need some sort of motivation in order to excel in their performance. This booklet has so far highlighted and outlined some of the many ways in which the girls/females are specifically de-motivated and discouraged from attaining their full potential and fulfilling their dreams and ambitions. Special efforts must therefore be made to motivate girls from an early age, when they are still discovering their potentials and when their interests and dreams can still be positively and easily influenced. It is therefore befitting that the last chapter of this booklet addresses the issue of motivating girls at the lower and upper primary school levels.

4.1 Perspectives on Motivation

Motivation can basically be viewed from two perspectives, namely, intrinsic and extrinsic motivation.

4.1.1 Extrinsic Motivation

This is a type of motivation that originates from outside the person. It is an external incentive that moves/forces the person into action or better performance. It is a motivation that is based on rewards and punishments as a consequence of the action to be taken. In the case of students and school performance the external incentive or extrinsic motivation would include gifts and/or praise from the school, the parents and even friends, for good performance/behaviour, and punishment or even ridicule from fellow students, for poor performance/behaviour. In the case of working adults, motivation may take the form of good conditions of service, trips outside the work place, a promotion or rise in salary, as opposed to demotion and stagnation.

4.1.2 Intrinsic Motivation

Intrinsic motivation is self-motivation, or a drive from within one-self, possibly stemming from what one believes, admires and/or values. It is engaging into an action for its own sake. One is motivated into action because of the personal satisfaction one gets or hopes to achieve through such action and/or performance. In my view, this is a much more difficult type of motivation to inculcate but once achieved, it is much more lasting because it does not depend on the good will of others or the availability of funds for gifts and other material gains.

4.2 Types of Motivation

The experts in this field have grouped motivation into two categories, namely, primary and secondary motivation. "*Primary Motivation*" is the motivation to satisfy obvious biological need like hunger, warmth and thirst. "*Secondary Motivation*" on the other hand is developed as a result of specific learned experiences and does not at least directly serve any biological needs. For example one acquires a need to achieve or to succeed, and the need to be respected and loved. It should however be noted that *Secondary Motivation* actions might indirectly lead to the satisfaction of *Primary Motivation* in some cases. For instance one's need to succeed as a carpenter may eventually answer their hunger when they sell some pieces to buy food.

A famous psychologist, Maslow developed what is known as Maslow's hierarchy of human needs, ranging from the basic biological needs to the satisfaction and joy of personal achievement. This hierarchy is summarised below, starting from the lowest to the highest level of needs.

1. Basic Needs

a. Biological Needs: the obvious biological and physiological needs for food breathing and, shelter and clothing for warmth.
b. Safety Needs: the need for physical security of person and property.

2. Psychological Needs

a. Social Needs: the need to belong and the need for love.
b. Self-Esteem: one's need for respect, fame, prestige and a feeling of success.

3. Self-Actualisation Needs

These are one's need to be creative, innovative and to achieve one's full potential.

Maslow put this theory forward stating that one can not be motivated to achieve higher needs in the hierarchy before achieving those lower in the hierarchy. However, this is quite contrary to what commonly happens today. Many people for example, ignore their need for food, a basic need, in order to loose weight so as to achieve their need for self-esteem and love, which are much higher in the hierarchy. Olympic and other sports performers sacrifice eating, drinking and personal relationships in order to achieve fame and prestige. Despite this shortcoming however, the categorisation continues to serves a very useful purpose in terms of informing and guiding people about the concept of motivation.

In order to motivate some one, one should know their sense of value and what type of motivation is likely to spur them into action. It is believed that most of the adult people's behaviour is motivated by a mixture of both extrinsic and intrinsic motivation. On the other hand, experience has shown, as would be logically expected, that extrinsic motivation is quite important and effective with the young people who may not have yet developed appropriate intrinsic motivation. In fact, I think that intrinsic motivation can be developed more easily, starting with extrinsic motivation, as the leaner grows physically and mentally, and begins to appreciate the need and importance of self-drive. At the school level therefore, different forms of incentives need to be provided not only to get action but also to help the development of intrinsic motivation. Such incentives if carefully chosen, will provide the specific learned experiences that form the basis for the "secondary" type of motivation. In the case of the students, it is important that the teachers work closely with the parents to identify the learners' needs and hence provide appropriate motivation for them.

4.3 Motivating Girls in STVE at School

Given the discussion so far, it is reasonable to assume that the level of the need and hence the motivation to achieve varies from children to adolescents to adults. One reason for this assumption is the level of learned experiences that can lead to both intrinsic and the secondary type of motivation. Apart from this obvious difference however, it has also been found that girls and women tend to be motivated differently from the males. In other words, gender differences have been observed in the need and hence motivation to achieve.

This gender difference can be explained using environmental factors with a little probable influence from biological factors. It is possible that male hormones may encourage aggressiveness and competition in humans, as they are known to do in other animal species; and aggressiveness may facilitate ones efforts to achieve by for example, increasing their opportunities

to do so. Should this be the case, then the need and hence the motivation to achieve may be slightly higher in males than females. What is certain however is the fact that most societies the world over encourage the boys to set high personal goals while at the same time training girls to put other peoples needs and goals before their own. In other words, the need for personal achievement and success is discouraged and actively thwarted in girls right from an early age, while that of the boys is encouraged and applauded. In addition, the gender stereotyping of roles and careers and hence expected behaviours and practices also contribute greatly to the observed differences in the quest for success and achievement. For example, until recently, most societies would treat a woman with contempt if she left a baby or young children with their father or relatives to pursue higher studies or a career, but would greatly encourage a man to do a similar thing. Consequently, the girls/women have unfortunately learnt to "tone down" or lower their aspirations and hence need and motivation to achieve. In order to reverse this trend of thought, expectations and practice, conscious and systematic efforts must be made to help the girls re-gain their confidence and to increase their motivation.

The rest of this chapter will concentrate on what can be done to motivate girls in the STVE areas of study at the upper primary and lower secondary school level.

4.3.1 Gender Inclusive and Girl-Friendly Content, Approaches and Practices

It is known that one's interest in something can motivate them to participate actively in it. In chapter 2 of this booklet, I discussed the importance of developing gender inclusive and girl-friendly type of content. Such content, which builds from relevant and familiar knowledge, is likely to capture the interest of the girls, and hence increase their motivation, participation and performance. Moreover, if the content is taught using appropriate gender-sensitive and gender-inclusive methods and techniques as discussed in chapter 3, then girls too are likely to be more motivated to learn and achieve in STVE.

There are quite a number of classroom practices that can be used to encourage learners, particularly the girls. First and foremost, teachers need to set equally high expectations of both the male and female learners. Secondly, the types of questions asked, the frequency as well as distributions should not reflect any gender biases. Teachers need to make a conscious effort to ensure that the girls who appear shy and slow are given ample time and encouragement to participate in class. The girls are likely to eventually respond with more confidence and interest once the teachers persistently show interest and concern for them. It is also a good idea to share the gist of the "marking schemes" with the learners as the teacher discusses class

exercises and tests. Many students get encouraged and motivated to achieve if they know what to strive for in terms of the nature and scope of the answers required of them. For example, in chemistry, is a word-description of chemical reactions adequate or should it always be further illustrated by the actual chemical equations wherever possible? Should such a descriptive equation necessarily be balanced or not? Do diagrammatic representations and illustrative examples earn extra marks or not? Lastly, all efforts should be augmented with appropriate guidance and counselling. If done well, it can be quite motivating to students and hence encourage good performance and continued study of STVE, as detailed in chapter 4.

4.3.2 STVE Exercises for Girls

As indicated in chapter 1, a lot of the STVE content builds more on boys rather than girls' lived experiences. The girls therefore feel extremely incompetent due to lack of exposure and experience with the content being taught and hence appear passive and lacking in interest. This seems to be bone out by some projects carried out elsewhere such as WISE (Women Into Science and Engineering) and GIST (Girls Into Science and Technology) in England. They carried out specific programmes in which the girls got hands-on-experiences with S&T materials and equipment outside the normal classes. The girls gained more confidence in science classes and many pursued further studies in the science-based fields. Similar ideas prompted the "Girls' Science Clinics" in Ghana, West Africa and the "Science Camps for Girls" in Zanzibar, Tanzania and Zimbabwe.

Such projects would help girls not only to become familiar with the materials, but also give them practice without competition and intimidation from the male peers. Their confidence in handling the materials will be developed, their interest in the subjects increased, and their understanding of the concepts greatly facilitated. The end result of all this is likely to be better performance. It should be noted here that such exercises are much more cost-effective and sustainable if they are carried out at the school level rather than at national or regional levels.

4.3.3 STVE Apprenticeship Projects for Girls

The concept of learning on the job is as old as humankind. Both men and women, albeit in their stereotyped roles and careers, used and still do learn a lot through watching and working with others under close supervision. This is known as apprenticeship and it is similar to what is commonly known as Internship in the training of medical doctors. The WISET project referred to above found the apprenticeship approach to be quite motivating to the young girls. Some girls from high school were posted to work for several weeks with ladies in S&T-based jobs and careers. The girls were able to get first hand

experience of the job requirements in terms of the academic qualifications as well as other demands such as self-discipline, time management, and personality traits.

Apprenticeship programmes are therefore useful as they widen and deepen the knowledge on career prospects and their requirements. They can be very motivating for the young aspirants and they definitely facilitate a well-informed choice of jobs and careers.

4.3.4 Incentives for Good Performance and Creativity

As indicated above, extrinsic motivation or external incentives is quite important with young people who have yet to learn to value education as necessary for ones well being. Schools should therefore endeavour to have useful, appropriate incentives that are not necessarily expensive, but quite valued at the school. These can range from simple and easy to implement strategies such as announcement and verbal praise at a school assembly or parent-teacher-pupil gathering, to the award of appropriate but cheap scholastic materials, to termly or yearly scholarships. The people, associations, industries and companies that are STVE-based can be approached for small presents as incentives. While there should be incentives that are competed for equally by both boys and girls so as to improve the performance of the girls relative to that of the boys, a few incentives that are specific for girls should also be encouraged. Such girl-specific incentives will help to motivate more girls into good performance. Otherwise, incentives help to create and sustain confidence and interest, as well as encourage innovation and creativity among the learners.

4.3.5 School STVE Clubs

The idea of school science clubs is an old idea that had died down in many schools. This is possibly because the activity does not usually carry any remuneration with it and therefore greatly depends on the interest and commitment of teachers involved. What needs to be done now in revamping the idea, is to recognise its importance not only as a motivation strategy but also as an activity, which can be used effectively to facilitate learning. Club activities are a most attractive supplementary approach to learning as it can be a lot of fun and learners are likely to remember what they have enjoyed doing as they chat and discuss among themselves. When organised properly, club work can bring out the relevance of STVE and help learners, particularly girls, to develop and sustain interest in STVE.

Through such clubs learners can:

- carry out hands-on work related/building upon class work in STVE;
- conceive and do projects that relate to real life problems and issues;
- make regular field visits to STVE places;
- develop a reading and research culture, through their work on projects;
- develop and learn to value creativity and innovation.

In cognisance of this importance, club activities need to be properly planned, budgeted for, closely monitored and periodically evaluated to improve them. The teachers who take responsibility for them therefore need to be remunerated in some way, so that they too are motivated to keep the clubs functioning well.

4.3.6 Visits and Discussion with STVE Role Models

Apart from STVE clubs, which are voluntary, schools should set up programmes for all learners, where role modes in STVE are invited to the school to give talks, seminars and have discussions about their work, jobs and careers. Efforts must be made to invite many female role models so as to help eliminate the myth from boys, girls, teachers, parents and the community that girls can not succeed in STVE fields. Occasionally, when the funds allow, the girls should be taken to visit and have discussions with the role models at their places of work. This will not only motivate the girls, but also helps to develop their confidence, interest and aspirations in STVE.

4.3. 7 Assertiveness and Leadership Training

There is ample evidence that many girls lack self-confidence. In the recent regional FEMSA findings for example, poor self-concept emerged in all the participating countries as a major factor, which greatly affects girls' participation and performance, in STVE. The girls simply don't believe they can succeed and hence many give up easily or put in very little effort. Furthermore, many girls are easily intimidated, harassed and even persuaded into wrongdoing and/or into what they would not have otherwise done, because they are not assertive and lack negotiation skills. In mixed or co-educational school, girls in STVE are easily booed out of answering questions in class; shoved, pushed and left out of hands-on- work in practical lessons; and teased or harassed out of seeking assistance and remedial work from male peers and teachers. Therefore, girls need training to help them acquire assertiveness and leadership skills. Such training will empower them and help them develop the self-confidence they need to deal appropriately with academic and other challenges in STVE in particular and life in general.

These skills can be systematically and more directly developed through specialised training programmes. They can however also be developed through many school activities, such as debating, public speech like summarising the weekly school news or taking a prayer reading, music dance and drama, and role-plays of appropriately chosen issues and situations. What is important here is that the girls have to deliberately be put into the leading roles in these activities, because left on their own, they will gravitate into spectators in a debate or discussion, or the general chorus in a drama or role-play. It is further important to remember that once put in such roles, they should not necessarily be left "to sink or swim" without assistance as deemed necessary, because they may instead be frustrated into giving up rather than making efforts to rise up to the challenges. Once they develop self-confidence, girls will be able to effectively participate and compete favourably with the boys in all activities.

4.4 Concluding Thought

In this concluding chapter of this booklet, I have discussed some possible ways of motivating girls in the STVE fields of study. The chapter, under section 4.3.1 has highlighted the fact that major ways of motivating girls are those that have been discussed in earlier chapters, as remedies to the identified problems. These are the problems of inappropriate curricula and other educational materials, poor teaching methods and classroom practices, and lack of appropriate guidance and counselling for the girls. In other words, the chapter itself is an appropriate conclusion to the booklet in as much as it also consists of the gist of all the preceding chapters.

A few of the motivational strategies suggested such as the apprenticeship projects and visits to and from role models may be a lot easier to implement in the urban than the rural areas and with poorer schools. However, this does not put these strategies completely out of reach of the rural and the poorer schools. For instance, if the school authorities are committed to the cause they can invite a few role models and even take pupils to visit some at their places of work, but the frequency of the visits will be less. I wish to further emphasise here that visits should not only be made to high level STVE plants and industries, but also to the small-scale projects that are usually within the reach of rural schools too. The STVE exercises and clubs may require a few relatively expensive materials. They however mainly depend on the teachers' creativity and abilities to improvise, planning well in advance with the school authorities and making the best out of the surrounding environment.

CONCLUSION

In this booklet, I have discussed four of the major problems and issues that affect girls' participation in scientific, technical and vocational education. These problems are particularly significant at the upper primary and lower secondary education it is then that learners become seriously aware of their potentials while they at the same time start on the serious study of STVE. The aim is to sensitise some of the major stakeholders so that appropriate remedies to the identified problems can be developed and implemented. When UNESCO, through the special project on "STVE for Girls in Africa", commissioned me to write this booklet, I saw a unique opportunity to share some of the ideas that I have gathered, conceived and/or developed over the years. I believe that the suggestions and the exercises included in this booklet can easily be tried out. I have deliberately not quoted specific references because many of the people targeted by this booklet may not find it easy to come across such academic reference materials. I have however given a few references at the end of the booklet to encourage general reading about the issues raised and the remedies proposed.

All the strategies and ideas discussed and suggested in this booklet are, in my view, basic to any efforts to achieve girls' increased participation and performance in STVE. Furthermore, I believe that they need to be carried out simultaneously in order to have a significant and fast impact. If implemented well, they will not only increase girls' participation and performance in STVE, but the boys too are bound to benefit. They will also result into fundamental, positive changes in education which are desirable and fit in well with the world-wide trends of the provision of STVE for All. As indicated throughout this booklet, a lot of the strategies can be implemented at the school level by a committed school administration and teachers. This brings to mind the efforts of another Africa regional programme, known as the "African Forum for Children's Literacy in Science and Technology" (AFCLIST).

AFCLIST supports small-scale projects that are aimed at improving children's interest and literacy in science and technology. Some of the AFCLIST-supported projects include: the recycling of waste paper into new paper for use in school; the fabrication of gadgets like sewing machines and battery-driven electric burglar alarms; and the preparation of a children's magazine by pupils themselves. Through such projects, AFCLIST has clearly demonstrated that a lot can be done with the resources available from one's surroundings if one is creative and committed. The challenge to you and I therefore, is to offer our time and use our education and experiences to ensure that the young people, particularly girls, get the opportunity to access, enjoy and pursue studies in STVE for a better future for us all. It is extremely important to make good records of not only the products but also the

processes of all efforts undertaken. It is from the detailed records of the processes that one can judge the cost-effectiveness of the interventions. There is need to demonstrate the viability and sustainability of these efforts on a small scale such as the school level. It will then be easier to convince the powers that be, to develop appropriate policies and have the successful interventions mainstreamed into the strategies and plans at the sub-regional and national levels.

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