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Female Participation in Mathematics and Statistics Programmes by Open & Distance Learning: Challenges and Experiences

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ABSTRACT

Completion rate for female students on the Bachelor of Science Degree programme in Mathematics and Statistics is lower than that of their male counterparts at the Zimbabwe Open University (ZOU). A cross-sectional survey was conducted to establish the challenges and experiences of female students on an Open and Distance Learning (ODL) Mathematics and Statistics programme. Data was collected using questionnaires to tutors and students.

Registration documents were reviewed to ascertain enrolment ratios for males versus female. Pass and failure rates were analysed as well as student completion rates by gender.

Female participation is low on the ZOU, ODL Mathematics and statistics programme. It appears drop-out rate is high resulting in low completion rate. Female students experience frustrations as they try to accomplish academic goals, and at the same time, fulfill their social obligations. The findings indicated the need to examine potential gaps between the inputs of instructor and those of the learner created in part, by gender issues. The professional and technical support female students receive as they proceed with their studies is key to enrolling and completion of the BSc Mathematics and Statistics programme by ODL.

Key words: completion rate, open distance learning, female, participation.

INTRODUCTION

The teaching of Mathematics and Statistics starts with the learners who should be intrinsically motivated. The facilitatory role of the tutor is to encourage students adopt a positive attitude towards the subject and develop students’ capacity to take charge of their own learning, Backhouse (1992). However, questions may arise concerning the functioning of algebraic reasoning, its characteristics and the situation conducive to its favourable development, Bednarz et al (1996). Women in Mathematics and Statistics face challenges and completion rate is generally lower than that of their counterparts. The situation is even worse with Open and Distance Learning Programmes. Bishop et al (1983) emphasize that social factors impinge on teaching and learning of mathematics. Teacher perceptions as well as student attitudes towards the subject have a bearing on the outcome.

A cross-sectional survey was conducted to establish the challenges and experiences of female students on an ODL mathematics and statistics programme for the Zimbabwe Open University (ZOU). The researchers used questionnaires to elicit information from tutors and students. Registration documents were reviewed to ascertain enrollment ratios for females versus males. Pass and failure rates were analysed through documentary evidence. Student completion rate was also assessed by gender for a group that had completed part four of the BSc Mathematics and Statistics programme.

While the study set out to identify gaps between the inputs of the instructor and those of the learner, created in part, by gender issues, Brown et al (1997) reiterated that language is necessarily instrumental in developing mathematical understanding. The significance of gender in mathematics education could be viewed from the influence of socialization and learning and teaching styles on girls’ attitude and attainment in mathematics, Burton (1996). It is important that the tutor understands the distance education learner from a gender perspective if reasonable services are to be offered and improve on programme outcome. Awareness of the issues that affect female students on a mathematics programme by distance education can enhance the development of strategies that could be used to develop and support programmes, Burton (1986).
Generally there is a belief that mathematics is a tough subject that is not suitable for girls. Very few women have made it to the top in the field of mathematics, hence the absence of role models in the area. In these modern days, it is high time that attention is given to the complexity of issues involved in the provision of equal opportunities in mathematics education, Burton et al (1995). Motivation of females to take up mathematics need to be initiated at an early age.

Open and Distance Learning (ODL) has emerged as a powerful instrument for augmenting opportunities in such fields as vocational training, especially for women, Thiyagarajan (2009). Open Universities have the potential to make women realize their full potential as they develop competencies and skills for improving employment opportunities for the disadvantaged, especially women. Women are deprived of higher education opportunities at an early age for various reasons, ranging from restrictions in the form of traditional patriarchal practices, and lack of financial support. ODL programmes are ideal as women can pursue their education while they engage in other responsibilities.

Elsewhere, the Ohio Council of Teachers of Mathematics have a programme that promote women to take up mathematics. Interest for mathematics need to be cultivated from as early as pre-school age and dispel the myths that mathematics is a difficult subject. Among their objectives, the Ohio Council of Teachers aims to promote leadership among women in mathematics education. This concept assists to groom mentors in the field of mathematics and statistics, http://www.ohioctm.org/index.html. In a study conducted by the University of Illinois on an online programme, use of former students as mentors, was found to reduce student non completion rate by 3.5 percent. The enrolment rate and the rate of success improved, Bole et al (2011). The University encourages research in the area that looks at factors that affect the study of mathematics by women. ODL institutions are currently encouraging such studies and the findings should be utilized to improve enrolment as well as programme delivery.

While mathematics and statistics deal with abstract concepts that are perceived to be difficult to assimilate, female students on such programmes face a multitude of challenges ranging from the use of mathematical language or algebraic concepts, social obligations to family commitments. For the Zimbabwe Open University, high failure and high dropout rates for female students have been observed. With the efforts made by tutors to obtain good results, challenges continue to be observed with female students.

In the cross sectional survey that was conducted, several issues were revealed about challenges and experiences faced by students. Documentary evidence and interviews with students confirmed some of the findings.

RESULTS

List of issues highlighted by students as being challenges

1. Time management problems
2. Inadequate time allocated for face to face tutorials
3. Non availability of tutors for some courses
4. Social responsibilities
5. Distance from tutorial venues
6. Technophobia
7. Unaffordable fees
8. Inadequate resources in rural areas

The issues above were highlighted by students on the BSc Mathematics and Statistics programme. It appears the challenges are of both individual and institutional origin.

Tutors were asked about what they thought were the major challenges, and these are listed below:

List of issues perceived as challenges by mathematics tutors

1. Students not familiar with ODL
2. ODL concept was new to tutors and students
3. Competing areas of focus on the part of students
4. Inadequate technological support services
5. Tutor shortages
6. Shortage of experts

None of the tutors interviewed received basic training in ODL. Technological competencies was not much of a challenge for the tutors as it was for the learners.
Students Experiences on ODL mathematics and statistics programme

1. Student support is minimal
2. Inadequate learning resources
3. Frustrations when I fail an assignment or exam
4. Difficult courses
5. Tutors are very helpful
6. Work-books are good for tough courses
7. Assignment feedback before exams is very useful
8. Minimal family support
9. Not sure of job prospects
10. Some courses not relevant for my job
11. Use technology go give lessons

Students’ experiences revolved around the need to get support for their learning. Family support was reported as being minimal by some students.

Table 1 below highlights female enrollment status in one mathematics and statistics group.

<table>
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<tr>
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<th>F</th>
<th>M</th>
<th>Year</th>
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<tbody>
<tr>
<td>Part 1, 1st semester</td>
<td>12</td>
<td>23</td>
<td>2006</td>
</tr>
<tr>
<td>Part 1, 2nd semester</td>
<td>10</td>
<td>21</td>
<td>2006</td>
</tr>
<tr>
<td>Part 1, 1st semester</td>
<td>10</td>
<td>20</td>
<td>2007</td>
</tr>
<tr>
<td>Part 2, 2nd semester</td>
<td>9</td>
<td>20</td>
<td>2007</td>
</tr>
<tr>
<td>Part 3, 1st semester</td>
<td>9</td>
<td>19</td>
<td>2008</td>
</tr>
<tr>
<td>Part 3, 2nd semester</td>
<td>8</td>
<td>19</td>
<td>2008</td>
</tr>
<tr>
<td>Part 4, 1st semester</td>
<td>6</td>
<td>19</td>
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</tr>
<tr>
<td>Part 4, 2nd semester</td>
<td>6</td>
<td>18</td>
<td>2009</td>
</tr>
</tbody>
</table>

The table shows a clear distinction on the numbers enrolling for the BSc mathematics programme. While enrollment for female students is generally low, student attrition rate is also high for females, with almost half the number managing to write the final examination. From documentary evidence, pass rate was below fifty percent for most of the courses.

Students who enrolled on the programme received modules, assignment questions, work books and tutorial letters as their study package at the beginning of each semester. Six hour tutorial sessions are conducted per course per semester. This is assumed to be adequate enough to ensure that student go through the course. However, both students and lecturers concurred that time for tutorials needed to be increased.

The introduction of mathematics at an early age is viewed as one way of reducing dilemmas in the teaching and learning of the subject. As students progress, they are gradually introduced to the conceptual mathematical constructions up to the fundamental theorem of calculus. More abstract concepts are introduced in a stepwise fashion without necessarily causing data congestion. Knowledge and ability to solve mathematical problems is one way female students could be motivated to enjoy the subject. Learning the language of mathematics and understanding mathematical symbols play a crucial role in the field of mathematics. The meaning of mathematics, the social aspects of mathematical development, subsequently come into play. There is clear evidence of how mathematics is viewed to be an individual and collective process.

With the rapid developments in distance education, interest continues to increase in issues surrounding curriculum growth and control. Both politicians and educationists are at the centre stage researching on issues related to women in mathematics. Learner support services are available for BSc Mathematics and Statistics students. It appears, female students experience unique challenges that may require special attention. The significance of learner support to the learner is critical. Other studies showed how possible it was to reduce attrition rate through the use of former students as mentors. Use of ICT in the delivery of mathematics and statistics programmes can be used to give extra tutorials to slow learners and those learners where distance is a limiting factor. Maintenance of quality programmes would also assist to increase student enrollment.

Female learner support needs to be upgraded and made an integral component of the distance education system. The success of distance education is highly dependent on the learner support system in place. By definition, ‘Learner Support Services’ are those services rendered to the learner in order that they realise their goals. The learner support services for females should address both course factors, personality issues as well as environmental factors.
Mathematics is undoubtedly an essential part of the curriculum. The number of teachers and the amount of time devoted to the subject is critical. The current shortage of mathematics tutors has compromised on quality of teaching mathematics. Students may find themselves with a lot of information that they may not have time to assimilate. Such approaches could add to the frustrations of female students who may be bewildered with other psycho-social pressures.

For ZOU, the Regional Programme coordinator is expected to give information to students about fees, available resources, policies, learning materials and other relevant activities. The Coordinator facilitates with the coordination of learning processes including organising tutorials and keeping students’ records. Supported students are less frustrated and focus more on their studies.

Administrative support, tutorial support in the form of meetings or face to face tutorials as well as student group discussions may assist to reduce dropout rate and increase female student enrollment. This reduces a sense of isolation and is of significant importance for female students on the BSc Mathematics and Statistics programme.

Tele-conferencing or tele-tuition could also be used to support female students. Where distance is a challenge, and electricity is available, electronic mail or use of compact discs could be utilized to deliver information to students. Television lessons are also a viable form of student support system. Feedback on written assignments should always deliver meaningful comments that should enhance programme delivery.

Before embarking on a programme, students need to ensure their self-efficacy in terms of articulating some of the algebraic concepts. Student guidance and counseling would assist students with hints on study skills, time management including self-discipline.

Female students may not have adequate funding to pay for their tuition. The availability of funding facilities forms part of student support services. Such facilities would enable students to go through the programme without having to worry with source of fees.

Some female students my fall pregnant while on the programme and will need assistance with information on institutional policy with regards pregnancy. Tutors should bear in mind the fact that personal problems and social pressures may affect studies. The support services given become critical as this will determine the student’s motivational levels as well as the success rate. Female students should be encouraged to work in teams to reduce isolation and frustration.

RECOMMENDATIONS

Dialogue with the tutor ensures proper guidance and mentorship. Module written for the students should be self-explanatory in order to reduce frustration and increase understanding of concepts. In this study, students appreciated the use of work-books that have simplified worked out mathematical examples. However, the problems that the mathematics teacher experiences should also be considered by the relevant authorities.

Work obligations, language problems and family responsibilities are common forms of stressors to female students. As such, the distance Education tutor needs to understand fully the characteristics of his/her students. Because of the recent development in ODL, some students might be experiencing distance education for the first time. They would therefore need counseling on the various aspects of distance education. The same goes for the lecturers who, in most cases, have their roots in the conventional system of education.

Training of distance education practitioners is crucial as learner supporters need to have a clear understanding of distance education and the processes involved. An insight into the type of environment of distance education, the characteristics of the learner as well as knowledge of stages involved in materials production and programme delivery is critical. Distance between the tutor and the learner can be reduced by the use of well written modules that are interactive. The significance of learner support hinges on programme outcome in ODL. ICT and Library services complement learner support.

The University is making an effort to establish district centers in every region. The major aim is to take the learner support services closer to the learners. Currently, all tutorials and student guiding and counseling activities take place in the Regions and special attention need to be given to female students, where student attrition rate is very high.

Female students need to be assured of the possibility of gaining employment at the end of training. Students currently have an interest in knowing who is delivering the distance education programs and the qualifications they hold. Programme relevancy and its acceptability to stakeholders can be a major attraction for enrolment onto a programme.

Contact and Sabbatical leave are important opportunities for lecturers to get exposure and experience from other institutions of higher learning. The visits aim to enrich programme delivery. Regular programme evaluation would assist to enhance programme acceptability. This could be done through the use of consultants.

There is great need to enhance women opportunities in Mathematics education. The role of distance education in advancing women’s potential cannot be over-emphasised. Currently, the issue of gender mainstreaming in mathematics and Science education is at the forefront of educational research. The need to increase mathematics and Science teachers is clear. However, there is need for institutions to address the issues of quality in programme delivery.
CONCLUSION

Worldwide, the concept of Mathematics for all is still yet to be realised. While a lot of effort has been made towards encouraging women to engage in Science and Mathematics, it appears a lot more still needs to be done creating conducive environment for female students to participate in mathematics fully. Open and Distance learning continues to be the most preferred mode of delivery for the adult learner and those who are working. Policymakers and educators need to work together towards supporting women in mathematics.

REFERENCES
