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Structuration Effects on Women Pre-service Student Teachers' Subject Choices

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ABSTRACT The paper explores the effect of societal pressures on pre-service female student teachers' choices to train as primary, high school or mathematics and science teachers. Data on 3288 pre-service student teachers from a School of Education at a university in Gauteng, South Africa was collected. The students' choices as per their gender were analysed. The results revealed that although female students were in the majority, a few of them opted to teach at high school especially in mathematics and science. The study found that the number of female teachers was inversely proportional to the increase in school grade. Content analysis of interview data showed that gender stereotypes strongly influenced course selection as most female student teachers feared acting against common expectations. The study also found that lack of role models of women in careers subsuming mathematics and science, seem to affect female students' attitude to mathematics and science. Recommendations on increasing women's access to mathematics and science education are suggested.

INTRODUCTION

This paper is on women pre-service student teachers' preferences on the school level they would want to teach; that is either primary or high school. It also investigates women student teachers' subject specialism choices particularly in relation to mathematics and science. The study was done at the School of Education, University of the Witwatersrand, Johannesburg, South Africa where these two researchers teach. The paper sought to determine the extend which societal forces; herein called structure (Giddens 1991) or individual choices, herein called agency (Giddens 1991), influence female student teachers' choices to teach at primary school or secondary school when they register for their Bachelor of Education degree at this institute. The paper investigated how structuration theory (Giddens 1991) explains women students teachers choices on these issues. The researchers contend that the school level that women teachers teach and the subjects that they teach or avoid to teach has important consequences on access and gender equity in education.

The paper begins by discussing the problem of inequity in education between the genders particularly in relation to mathematics and science. It problematizes this and argues that such inequity seems to be *social constructed* resulting in the marginalisation of women in education and the careers. After presenting the problem, the paper articulates the goals of the research and the research questions. The later sections deal with the theoretical framework, methodology, results, discussions, conclusions and recommendations.

Access to higher education is critical to female students for social justice. Gender equity must lie at the heart of education curricula and higher education curricula in particular. In recent years, it has been increasingly emphasised (see for example Boaler 2002; Lubienski 2003; Department of Education 2008) that there must be equity in education between all students[1] at all levels. For example, the South African curriculum which is hinged on healing the divisions of the past is built on the principle that all students irrespective of background or gender need to access quality education (Jansen and Christie 1999; Potenza and Monyokolo 1998; Taylor et al. 2003).

Risman (2004) sees gender as socially constructed expectations and roles deemed appropriate for men or women. Such perceptions lead to the 'othering' of women by men. The *othering* of women is unacceptable as it creates a gender-gap. The gender-gap in education has of late been an intense field of study by many scholars (Connell 1987; Andersen and Hill 1994; Deutsch 2007; Guiso et al. 2008). But this seems not to be the case in South Africa.

Importance of Women Mathematics and Science Teachers for Gender Equity

Mathematics and science are key in the pursuance of important careers that can reduce gender disparity in society. Research (see for example Hanna et al. 1990; Gallagher and Kaufman 2005) shows that while girls' performance in mathematics during early primary school is at par with boys, that balance begins to decline as the children enter adolescence. Lubienski and Benbow (1992) suggest that such differences occur primarily because of socialisation which encourages boys to show their talent in mathematics and science while at the same time covertly discourages girls to do so. However, the 2003 Programme for International Student Assessment (PISA) (Guiso et al. 2008), showed that girls' underperformance in mathematics and science does not mean that they are altogether academically inferior. It confirmed that girls universally outperform boys on reading scores (Guiso et al. 2008). Though there exist an achievement gender-gap between boys and girls in mathematics and science, recent research suggests that the gender of a student is immaterial in learning mathematics (see Kane and Mertz 2012).

In the South African scene there are far fewer women teachers in mathematics and science than men in a country already with an acute shortage of mathematics and science teachers. While in general the South African government is addressing the shortage of mathematics and science teachers (for example through Funza-Lushaka bursary scheme[2]), gender issues in mathematics and science education seem distantly addressed. Policy makers seem to have not yet seriously considered making mathematics and science teaching gender neutral.

Theoretical Framework

Gender issues in higher education may be studied in the realm of the critical paradigm (Freire 1970; Habermas 1990). The presumptions of the critical paradigm are that society is composed of different classes of people; the oppressors and the oppressed. For Freire (1970), the way students are taught and what they are taught mirrors a political agenda which can serve the interests not of the students, but of their oppressors. Critical theory assumes that women are an oppressed group. In this study we reserve the strong terms of oppressor and oppressed, as they seem too political, rather, we view society as having structures that tend to constrain women's career choices in education.

Thus, one way of researching gender-equity in mathematics and science teacher education is through structuration theory (Giddens 1991; Risman 2004). The two major notions of structuration theory are structure and agency (Giddens 1991). These exist in a dialectical flux. Structure is regarded as the overall socialisation and regulation imposed on individuals by society to maintain order, and possibly to avoid chaos and anarchy (see for example Emily Durkheim's functionalism; Gianfranco 2000; Craig 2002; and Weber's bureaucracy; Guenther and Wittich 1978). Therefore, structure suggests what people may or may not do; even what they think or may not think. In certain circumstances sanctions are imposed on those people who do not comply with societal expectations. Though created by human beings, when structure is internalised it appears natural. Bourdieu (1990) compared structure to what he called a field, which is the social domain in which an individual operates. The field has its own rules of behaviour. Emile Durkheim (see Gianfranco 2000; Craig 2002) regarded structure as key to the functioning of society.

Agency (Giddens 1991), on the other hand may be regarded as an individuals' propensity to act in their self-interests, capitalising on the affordances that structure provides, and sometimes even in opposition to structure. It relates to individuals' free will to think, plan and act; what they actually do despite societal expectations of them. Agency involves making choices and setting goals; and acting to achieve those goals through use of one's endowments and the resources that the environment may or not provide. It thus sometimes requires strategic planning and persistence to achieve one's goals despite challenges one may meet.

In his structuration theory, Giddens (1991) regarded structure and agency, not as dichotomies, but as interrelated phenomena. He argued that individuals' agency can influence structural change. Individuals may ignore structure if it is not in their interest and influence its change through their agency. The researchers agree that both structure and agency are important in that, while social structure may control human be-

haviour, individual human action also influence social structure in return if that structure is not favourable to those individuals.

Goals of the Study

This paper explored the enrolment and graduation statistics of female against male students in mathematics and science at the Wits School of Education. It also aimed to explore these students' choices to teach at either primary or secondary school. Against these choices, the study explored the experiences of female students that led them to these choices.

Research Questions

The paper was designed to address the following questions:

- What do the enrolment and graduation statistics for female against male students registered at Wits School of Education from 2007 to 2012 show with respect to choice of school level to teach, and choice to teach mathematics and science at high school?
- What experiences pre-determine female students' choices to train to teach mathematics and science at high school?
- What factors pre-empted them to choose to teach at primary school or high school?

METHOD

Design

This research used a mixed design (Creswell 2008) in that quantitative and qualitative data was collected and analysed in relation to each other in order to comprehensively answer the research questions. The quantitative aspect enabled the researchers to view the overall enrolment and graduation patterns of students over a number of years on the background of their gender. The qualitative aspect enabled the researchers to pursue the patterns observed in the quantitative data to further understand why those patterns were occurring in respect to female students' choices to study mathematics and science or to teach at primary or secondary school. This mixed design enabled the researchers to have more comprehensive data that helped them to better attain the research purpose.

In the interpretive paradigm under which qualitative research falls, new knowledge or findings emerge from the interactions between the researcher and data (Creswell 2008). The researchers aimed to make sense of or interpret phenomenon in terms of the meanings the people bring to them (Denzin and Lincoln 2000). When married to quantitative research, qualitative research brings about a better understanding of what is happening in and around the research phenomena.

Sampling

Statistical data on enrolments and graduation were collected for all Wits School of Education students from 2007 up to 2012. Since the Bachelor of Education degree is of four years duration, graduation data collected was for the 2007-2010, 2008-2011 and 2009-2012 cohorts only as the later groups are still in session. The researchers felt that it was important to have enrolment and graduation data for all Wits School of Education students over six years so that the general gender pattern on curriculum choices could be obtained. However, for interview data only female students were selected. Female students were selected because they were the unit of analysis of the study. The researchers wanted to investigate why they were selecting or not, mathematics and science as their major subjects. Three students per year group for those students still in session were randomly selected using their student numbers as random numbers. This stratified random sample was useful to find out what the students thought about choosing to teach at primary and secondary school and choosing to teach mathematics or science across the whole student population.

Data Collection Methods

Data was collected in two ways. The first type of data was quantitative, relating to enrolment and graduation statistics of students at Wits School of Education with respect to gender. The second type of data was qualitative relating to interviews conducted with female student teachers. The interviews were audio-taped to enable replaying over and over again in order to accurately capture what students really meant.

Enrolment and graduation statistics for male versus female teachers on the different phases and major subjects were collected. The statistical data was obtained from the faculty office

which keeps student records on registrations and graduations. The study zoomed in to collect enrolment and graduation statistics for those students majoring and sub-majoring in mathematics and physical sciences and life sciences for the 2007-2010 cohort, 2008-2011 cohort, and 2009-2012 cohort. The statistics were collected in such a way that the gender of the students was always prominent. The aim of the data collection was for the researchers to obtain gender related patterns in enrolment and graduation in relation to mathematics and science teacher education as well as school level of teaching.

Data was also collected from female students using semi-structured interviews. The interviews were semi structured to enable eliciting and probing students' responses so that a clearer picture of their thinking emerges. The interviews aimed to find out whether societal forces impinged on female students' choices in teaching at primary or secondary school as well as whether they were any societal pressures that influenced them to want to choose or not to choose to teach mathematics and science at high school. The interviews also aimed to gauge whether individual choices apart from social expectations had any effect on what female students studied for at Wits School of Education. So the interviews helped to uncover what gender based factors in society if any, affected female students' curriculum choices.

Data Analysis

Enrolment and graduation quantitative data was analysed using descriptive statistics. Tables, percentages and a bar graph were used to compare trends. Interview qualitative data was analysed through content analysis of verbatim statements made by the participants. Verbatim statements by various students were transcribed before they were analysed. The transcriptions were coded to come out with common themes in the interviews.

Ethical Compliance

Permission to conduct the study was sought and granted by the Head of School of Wits School of Education where this research took place. Female students were issued with information letters which explained to them the purpose of the research. The students were also informed that they were free to participate or not to participate in the study without any prejudice. They were assured of confidentiality. Students were informed that the research would be considered for journal publication. Students were then issued with consent forms in which they all agreed to participate in the research.

RESULTS

The results of the study fall under two subsections, quantitative and qualitative.

Quantitative Results

Numerical data were collected for yearly student teacher registrations starting 2007 up to 2012. Graduation data for those students who completed in the 2007-2010, 2008-2011 and 2009-

Table 1: Enrolment, graduation and dropout by sex for student cohorts 2007-2012

Gender	*Cohort*	*Total registration*	*Total graduates*	*Total moved*	*Total dropouts after registration*	*% Graduates (excluding dropouts)*	*Completed minimum time %*
Female	2007-2010	396	294	10	36	82	50
	2008-2011	203	129	8	33	76	51
	2009-2012	572	243	6	32	45	41
	2010-2013	343	0	8	32	0	0
	2011-2014	296	0	14	26	0	0
	2012-2015	359	0	12	36	0	0
Male	2007-2010	260	154	14	22	65	29
	2008-2011	154	57	12	18	42	21
	2009-2012	192	53	8	17	30	27
	2010-2013	208	0	12	20	0	0
	2011-2014	138	0	11	20	0	0
	2012-2015	167	0	13	12	0	0

2012 cycles was also collected. The quantitative results were aimed at addressing the research question: *What do the enrolment and graduation statistics for female against male students registered at Wits School of Education from 2007 to 2012 show with respect to choice of school level to teach, and choice to teach mathematics and science at high school?*

Analysis of registration data shown in Table 1 indicates that there are more female student teachers than males for each cycle. The enrolments show that over six years from 2007 to 2012, 2169 female students registered to study for the B.Ed. degree against a total of 1119 male students. Thus, female student teachers were in the majority making 66% of the total number of students. In these six years, 195 female student teachers dropped out (9% of the total number of female students) against 109 male students who dropped out (9.7% of the total number of male students). Thus, in general the dropout rates for the male and female students over the past six years were comparable.

Table 2 shows that on average women fared better than men in terms of graduation rate for the 2007-2010, 2008-2011 and 2009-2012 cohorts. The average graduation rate for women was 57% against that of men of 44%.

Table 2: Enrolment and graduation by sex for 2007-2010, 2008-2011 and 2009 -2012 B.Ed. cohorts

Gender	*Total registered students*	*Total graduated*	*% graduated*
Female	1171	666	57%
Male	606	264	44%
Total	1777	930	52%

The above statistics show that women are doing far much better than men in terms of enrolments as well as pass rates. It would appear that the Bachelor of Education course is actually favourable to women students.

Below is an analysis of the phases and the subject majors that these very students studied for their Bachelor of Education degree.

Table 3 shows that for each of the cohorts 2007-2010, 2008-2011 and 2009-2012, the great majority of the students who graduated, studied to teach at the Foundation and Intersen phases (primary school level). The table also shows that the majority of the students who studied at the Foundation and Intersen phases were women.

Table 4 summarises the scenario in Table 3. It shows that over the three cohorts, 544 female students graduated against 194 males. However a closer analysis shows that most of the female students qualified to teach for the primary school phases. 402 female students out of 544 students qualified to teach at the primary school grades. This was 74% of the students who qualified in those years. Also, 100 female students qualified to teach at high school to teach subjects that were not mathematics and science. In total, 644 students out of 738 students who qualified over the three years 2010 to 2012 did not study to teach mathematics and science at high school. This means that 87% of those students who qualified did not qualify to teach mathematics and science. Only 42 female students qualified to teach mathematics and science at high school. That is 8% of female students who qualified and 6% of all the students who qualified. At the same time 95 out 194 male students qualified to teach mathematics and science that is 49% of the male students.

Clearly there is an equity problem in the enrolment and graduation rates of student teachers in terms of graduating in mathematics and science teaching. Even though 74% of the stu-

Table 3: Number of graduates by phase, subject major and by sex for 2010, 2011 and 2012

Gender	*Total number of students who qualified by phase, specialisation and by sex*					
	Calendar year	*BEd (Foundation phase)*	*BEd (Intersen phase)*	*BEd (Sen/FET Phase) Maths*	*BEd (Sen/ FET phase) Science*	*BEd (Sen/ FET phase) Other subjects*
Female	2010	59	34	14	2	30
	2011	63	48	15	3	20
	2012	133	65	5	3	50
Male	2010	1	14	26	10	8
	2011	3	12	27	9	18
	2012	3	4	18	5	36

Table 4: Number of graduates by phase, subject major and by sex for 2010-2012

Gender	*Cohorts*	*BEd (Foundation phase)*	*BEd (Intersen phase)*	*BEd (Sen/FET phase) Maths*	*BEd (Sen/ FET phase) Science*	*BEd (Sen/ FET phase) Other subjects*	*Total*
Female	2010-2012	255	147	34	8	100	544
Male	2010-2012	7	30	71	24	62	194
Total		262	177	105	32		738

dents who qualified from the three cohorts were female which is a very good in terms of women success, only 6% of the total students were female students who qualified to teach mathematics and science at high school.

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For all the 137 students who qualified to teach mathematics and science only 42 of them were women. This represents 31%. These statistics show that even though teaching is a highly popular career for women, these women are attracted to teach at the primary grades. If they teach at high school, they prefer to teach non- mathematics and science subjects such as languages and social sciences. The female teachers avoid as much as possible to train to teach mathematics and science. The data analysis strongly suggests that few female students feel motivated to study to teach mathematics and science at high school. This suggests structure and agency problems.

Further analysis shows that only 8% of the female graduates were mathematics and science teachers. As for male students the situation is quite different. Male student graduation data shows that 50%, that is half of the male graduates were mathematics and science teachers. This is compared to only 7% of the female graduates who were going to teach mathematics and science. Fifty percent of males versus 7% of females graduated to teach mathematics and science. This showed well-defined inequity in the gender of mathematics and science trained teachers at this university over the three years.

Qualitative Results

The qualitative results aim to answer the research question: *What experiences pre-determine female students' choice to train to teach mathematics and science at high school? Also what factors pre-empt them to choose to teach at primary school or high school?*

The sub-questions included: Would you tell us your earlier experiences of learning mathematics and/or science? Why have you chosen/ not chosen mathematics or science as majors? Why have you preferred to teach at primary school or high school?

Recorded below are some of the verbatim responses of the participants:

Student A: "Our grade 8 mathematics teacher had this habit of asking students to come forward and do mathematics problems by ourselves on the chalkboard. One day she picked me up to work a problem I had no idea of on the board, when I could not do it, she mocked me in front of everyone. The whole class laughed at me. … I cannot explain how I felt. Since then I never want to see mathematics in front of me".

Student B: "It was my mother who first put me off by telling me that she was never good in mathematics. She said therefore she could not be of any help to me even if it was primary school level mathematics… in the long run it affected my attitude to mathematics so when I came to university, I could not choose maths as my major because my grade 12 pass in maths was very low".

Student C: "When I tell people that my mathematics is my major, they express their awe and say I am very clever. I have chosen maths and science as my majors despite the comments I receive from people".

Student D: "One year I won the prize as the best maths student. Outside the hall, a group of people came around me and asked me what I saw in maths. When I explained to them that solving mathematics problems was fun, they sort of looked at me as if something was very wrong with me. I wonder whether that would have happened if I were male".

Student E: "Our mathematics teacher was very strict with boys but as for girls he allowed us to hand in assignments late or redo assignments to get better grades. Thus us girls were never really serious with mathematics because the teacher was never serious with us doing mathematics well… One student alluded to me that the teacher held ulterior sexual motives on us girls".

Student F: "I was doing very well in maths and science at primary school and lower secondary till my father discovered it. He told me in no uncertain terms that mathematics and science was for not for ladies…Also in our society you could hardly see any woman who was following a maths or science related career such as engineering. It seemed to make sense... that affected my subject choice here at university… I prefer to be a conformist not a misfit".

Student G: "I always loved maths but I gradually discovered that people disapproved me of it. In order to survive, I sort of concealed my ability, I did not volunteer to answer questions in class, or offer help to other students even if I knew how… I just kept it to myself, performing only in important tests and examinations. Aah… discovered early enough that if you showed your mathematical ability as a girl, you are bullied. I have followed my passion despite the discouragement, now that is why I am training to be a high school mathematics teacher".

Student H: "Our teachers always presented mathematics in a way that is not at all intuitive… They gave us formulas to use to solve mathematics problems which gave us the idea that mathematics is just procedural; a collection of mechanical rules without meaning. I felt I could not carry on with such a subject…Also maths is not the only subject, there are many choices…and maths teachers are anyhow not paid more money that teachers of other subjects say Tswana or Zulu… so why worry?"

Student I: "Society, our family and teachers always gave us the impression that women's career aspirations must lie in the arts and social sciences and not pure sciences, maths and engineering. Women were supposed to be beautiful and not to excel in maths which was a male domain. We just adapted to that and followed those expectations to this day".

On asking one lady student why women prefer to teach at primary school rather than high school, she gave the following response:

Student J: "We women have a motherly role in society that is why we prefer to teach in the baby grades; the lower primary grades or preschool. We avoid teaching at high school because there the students are a bit grown up and tend to give disciplinary problems. Men are tough and more suited to enforcing discipline… lady teachers need to be tough and strict, rule with an iron fist for them to survive as teachers in the upper grades…Even if you teach at high school and an opening occurs for HOD, you see a man being appointed and women being overlooked… Also if a man opts to teach in the lower grades at primary school, parents are not happy with that… How many parents would be comfortable to have their girl children taught by a male grade one teacher? ….They would suspect that he could be a pedophile preying on their little daughters. But if they know that that man is gay, they feel safer".

Content analysis of students' experiences of the foregoing excerpts helps to explain students' choices. It also helps to explain why female students choose to teach at a particular school level. This corroborates the statistical analysis.

Student A's experience with her mathematics teacher is quite painful in that her efforts in learning mathematics were ridiculed. Student H's teacher projected to learners a distorted view that mathematics involves application of meaningless rules in order to obtain correct answers. Also student E narrates of the low expectations her teacher had of girls learning mathematics. The teacher obviously thought that it did not matter if girls under-performed in mathematics. Student B narrates the disapproval she had from her father in pursuing mathematics, despite her ability. This led her to have a negative attitude towards mathematics. Students C and G show that despite being discouraged to study mathematics seriously, these students persisted with mathematics and realise that mathematics is a subject that women can do well in and actually follow a career in.

Student D narrates of the ridicule society have on girls who do well in mathematics. There is also a shared view that not all people can understand mathematics, particularly women as exemplified in Student E's experience. Students H and I show that female students thought that they had many other career choices they could choose besides mathematics hence they felt it not so important to excel in mathematics.

Student J shows that her choice of school level to teach as well as subject to teach is strongly prescribed by society. Male and female student teachers are influenced on their selections by societal expectations. For example the student refers to the idea that society will be suspicious of a male teacher teaching young girls.

DISCUSSION

This section presents the main research findings. Certain themes emerged from quantitative and qualitative data analysis that attempt to answer the research questions motivating the study.

Theme 1: Lack of Exposure to Female Role Models

One of the themes that emerged is that female students lack exposure to female role models working in the mathematics and science fields. Related findings were established by Guiso et al. (2008). Role models have been seen to help learners be motivated through social learning (Bandura 1986). Female students not exposed to women successful in mathematics and science based careers may not conceive of themselves doing what has *never* been done before by any other woman. True, they have seen some female mathematics teachers but these are much fewer compared to men. Thus lack of role models influence female student teachers to ignore mathematics and science as majors.

Theme 2: The Myth that Mathematics is the Domain for Male Students

The results strongly support the existence of the myth that mathematics is the domain for male students. This myth has also been referred to by Kane and Mertz (2012). Kane and Mertz found the myth baseless as in countries such as Iceland where generally, there is equity between the genders in society; girls perform as much as boys in mathematics. Kane and Mertz have indicated that the gender gap in mathematics is strong in countries where gender inequity in society is strong. This finding of Kane and Merts supports structuration theory (Giddens 1991) in that gender differences are a social construction, and a reflection of gender inequity in the society in which the school is located. Society seems to reinforce this social construction which is then reflected in the school and university setting.

Theme 3: Unsupportive Mathematics Teachers

It emerged from the study that some teachers inadvertently reproduce the inequality between males and females in society in their mathematics classrooms. They are unmindful of the harm done to female students through low expectations of female students' achievement in mathematics and science (Guiso et al. 2008). Such teachers seem oblivious of the long term effects on female learners' long term career prospects. By the time female students reach university they are already alienated to mathematics and science and have no wish to study these subjects.

Theme 4: Female Student Teachers Feel That They Need Not Persevere in Learning Mathematics

The other theme that emerged is that female student teachers feel that they need not persevere in learning mathematics. They feel that there is no need for them to persist in a difficult subject such as mathematics, as they can specialise in other subjects and still receive equal remuneration with mathematics and science teachers. These students fail to see that many other careers are closed without a mathematics qualification. This bars younger generation women from entering important careers in science, technology, engineering and mathematics in the future.

Theme 5: Automatic Exclusion

Since female students generally do not perform well in mathematics in school leaving examinations, they are automatically excluded from specialising to teach mathematics when they register at university even if they want to because there is a cut off mark for those who want to register for certain subjects. Their exclusion to register to teach mathematics and science is the sum total of many social factors discussed above which discourage women in this field. This is very bad because it perpetuates inequity between the genders in the science careers.

Theme 6: Women are Caregivers

On the issue of selection to teach at either primary or secondary school the theme that emerged is that female students are more inclined to teach at primary school because they see their social role as caregivers particularly of young children. This is a societal expectation. Data clearly shows that for the six years 2007-2012, 74% of the total number of students who graduated for the Bachelor of Education degree were females who chose to teach at primary school. If they are to teach at high school they would rather teach non-scientific subject such as languages, social sciences and arts.

Despite the above factors militating against female students taking up mathematics and science teaching at high school or teaching at high school in general, there are some few cases of female students who exercise agency (Giddens 1991). These female students took mathematics and science courses because they found that these subjects were academically fulfilling to them. They showed that despite societal disapproval they were interested to pursue their dreams to teach mathematics and science at high school. These students love mathematics and science having experienced the intrinsic value and realise the important career prospects they can open.

CONCLUSION

From the findings of this study, it can be concluded that at Wits School of Education the choice to teach at primary school or high school or to teach mathematics and science at high school is very gender sensitive. Although female students comprised about two thirds of the student enrolment from 2007 to 2012, a huge proportion of those female students opted to train to teach at primary school. The study also showed that the female students largely avoided choosing to teach mathematics and science at high school. This occurs against a large proportion of male students who chose to teach mathematics and science at high school.

The findings of the study also show that the patterns in female students' choices can be explained thorough society's gender role expectations. Society prescription of women's (and men's) roles in society, were so over-powering to student teachers' curriculum choices. Female student teachers were quite reluctant to exercise their agency; to make choices if they were counter to societal expectations. Female students also revealed that all in all they are discouraged by family, friends, teachers and society against studying mathematics and science seriously. Most female students take this to heart thereby forestalling efforts to reduce gender inequity in mathematics and science education. The study clearly shows that the gender role expectations of society inadvertently push women to stay where they belong; that is being junior to men.

RECOMMENDATIONS

From the study it is clearly evident that social structure inhibits female students' acceptance of mathematics and science, which in turn perpetuates social inequality between men and women. To address this issue, the research makes the following recommendations:

Women role models successful in careers subsuming mathematics and science must be frequently exposed to female students, to enhance social learning. These models would give motivation speeches during high school and university open days specifying how they succeeded in their careers despite being women. Such models are likely to motivate female students to consider studying mathematics and science seriously as they would see that it is possible to succeed in mathematics and science careers even if you are female.

Bridging mathematics and science courses that re-teach high school mathematics and science need to be introduced at the university so that poor pass rates in mathematics and science at high school do not become a barrier to women students' access to mathematics and science teaching careers. Female students who do this bridging course would be given remuneration to reward their extra efforts.

Introduction of compulsory gender studies in the B.Ed. curriculum so that male students (and also female students) are made aware of the potential danger of mistreating girls in mathematics and science classes. This is because some teachers unknowingly undermine female students' efforts to learn mathematics and science.

NOTES

1 This paper is mainly on pre-service student teachers studying for a Bachelor of Education degree,

however the term student may also refer to pupil or learner as may fit the context under discussion

2 In 2007, the South African government responded to the shortage teachers in the country by introducing Funza-Lushaka University Bursary Scheme to boost the number of teachers in priority areas such as mathematics and science

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