GENDER ISSUE IN TEACHING AND LEARNING MATHEMATICS

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Abstract: Gender is a social construct with a power relationship between women and men who are distinguished on the basis of their biological differences. In terms of educational settings, gender is a mingled, spontaneous force that affects every social communication. The main purpose of this study was to explore gender issues in teaching and learning mathematics. I applied a qualitative approach working with one female and one male mathematics teacher and one female and one male student. The analysis of interview data revealed three major themes. To address these issues the schools, society, and families should give equal access, encouragement, empowerment and motivation to their daughters for enrollment in teaching and learning mathematics.

BACKGROUND

Gender issues have been discussed in many areas, for example, management and administrations, social works, development, politics, education, etc. "Gender is defined as a network of beliefs, personality, traits values, behavior and activities differentiating women and men through a process of social construction that has a number of distinctive features" (UNDP 2006, p. 82). Women and men are biologically different, but their roles, status, positions, responsibilities, and relationships are equal. Despite the reality, there is a discrimination that is still in existence between male and female concerning the gender-based factors in our society. The society treats males as superior and women are given weaker or inferior positions, although some changes can be felt with women in the position of president, chief justice, speaker of the house, the situation is not favorable for women in many aspects.

The patriarchal family structure has been common in Nepal, where females are dominated in every aspect of life considering men as superior to female (Gyawali, 2006, as cited in Bhandary, 2017). "The socialization of girls and boys shape their understanding of gender role and worldview. The deep-rooted socio-cultural norms and practices of the patriarchal system determine the roles of boys and girls."(Thapa, 2012, p. 37). It seems that society has marked the gender-based roles of males and females. The difference between their physical and biological aspects has been concerned without social phenomena. It has created a big gap in relation to male and female.

The principle of equality is related to providing equal rights to both male and female. Gender equality is considered to be achieved when women and men enjoy the same rights and opportunities across all sectors of society that should include economic participation and decision-making (Maxwell, n. d.). The dealing with both

male and female should not be different as both do have equal aspirations to lead the society and the needs of women and men should be equally valued, favored and addressed too. Although people talk about equal rights between male and female and constitution also guarantees such rights, the equalities has not been realized yet in practice. It is also a case in the area of teaching-learning mathematics in Nepal. There are various gender issues related to the realm of mathematics teaching and learning at school and in the college as well. Among these issues, in this paper, I have especially focused on a few female related issues about teaching and learning mathematics at the university level.

In my journey of learning mathematics from school to university, there were a minimal number of girl students in the classroom. There is still a misconception that mathematics is a difficult subject among students and parents (Gafoor, & Kurukkan, 2015). Such misconception has severely affected women enrolment and participation in mathematics education in Nepal. Mathematics is normally favored and controlled by men (Chipman, 2005). It is taken as a complicated subject for women. I have experienced and seen in the capacity of female mathematics educator that learning mathematics is more challenging for girls not because it is difficult by nature but by the social stigma of mathematics in general. As a result, there was a very smaller number of female students compared to males.

The participation of women all over the world is very low in economic, intellectual, social and political opportunity. One of the reasons could be due to the less involvement of women in education in comparison to men. Even if they are involved in education, they were not permitted or simply discouraged to become intellectuals in this sophisticated and complex subject. Amelink and Tech (2012, p. 2) described that “the views of mathematics by females are shaped in part by gender-based stereotypes which convey misconceptions that differently innate mathematical abilities existing between males and female.” In Nepal, mathematics is regarded as one of the tough subjects and less interesting ones. Participation of females in higher education in the mathematics department is very low as compared to males. Girls prefer to study "easier" subjects such as biological science, education, sociology, economics, home science, culture, Nepali and history. Even if many of the girls who are interested in science and mathematics, they get married before completing bachelor’s and master’s degree and leave their further studies. They don’t tend to continue and make their career in those subjects. Most of them do not get good family support and environment for pursuing mathematics in higher education. They are often compelled to shift from mathematics and science to other easier subjects. Therefore, the number of women completing masters and Ph.D. in mathematics and mathematics education is very low as compared to the male counterparts.

The overall female literacy rate of Nepal is low in comparison to the male literacy rate. The male literacy rate is 75.1% compared to a female literacy rate of 57.4% (CBS, 2011). The female literacy rate has increased from 42.8% (CBS, 2001) to 57.4% (CBS, 2011). Though there is a slight increment in literacy rate of females

through the period of 10 years, I have found very less percentage of females who have enrolled in different educational programs. Out of 1,652,624 students involved in several fields of study after completion of SLC, only 622, 012 are females i.e. only 37.64% (CBS, 2011). In the field of mathematics and statistics, there was an enrollment of only 2,820 females out of 17,260 students i.e. 16.34% in Tribhuvan University. It clearly shows that the participation of females in mathematics is low. From these reports, I discovered that there are fewer enrollments of the females in university education, particularly in the technical field.

When I started my professional life as a teacher from Balkumari College of Nepal, I found no girls in the mathematics classroom. In the college where I taught there were no female mathematics teachers teaching mathematics. So, I realized that it is a big issue in our teaching and learning context. I used to wonder why the number of girl students taking mathematics was less than that of boys or even nil. Why some of them left mathematics education without completing the course? Why do girl students take mathematics as a complicated one? Why is mathematics said to be irrelevant for girls? How could we empower girl students to learn mathematics? Therefore, I became interested to explore the issues behind those problems.

Various social, cultural and organizational barriers hinder women to be mathematics students and teachers at the university level. There are a great variation and inequality between men and women to participate in teaching and learning and joining a profession in mathematics, including other disciplines. In my experience, the involvement of females in mathematics teaching and learning at college and university levels have not been changed significantly in the last decade in Nepal. However, I have seen some improvements in teaching and learning, but it's not improving significantly as is expected to be. "Just as gender equality in education and women in the teaching-learning have strong linkages, so the issues of women, teaching, learning and the feminization debate also have a place within the broader context of gender equality in society as a whole" (Kelleher, 2011, p. 5). Actual scenarios of the females participating in teaching and learning mathematics are the main issues to be analyzed. In this paper, I am going to find out the gender-related issues, especially focused on women in teaching and learning mathematics.

METHOD

Following a qualitative approach, I have explored university-level teachers' lived experiences of being a mathematics education faculty member. I applied in-depth interviews as a tool to collect experiential anecdotes of female mathematics teachers and students. I used a convenience sampling technique with one female and one male mathematics teacher. They had more than 15 years of teaching experience at the university level. I also selected one male and a female student studying mathematics at the undergraduate level. I took an interview with the participants separately in their place of convenience; I did the audio recording of their interview without harming their ethics. I used a guideline to conduct in-depth interviews with the participants. The guidelines included a common set of questions to get the

information about gender-related issues in teaching and learning mathematics. Each interview lasted for about 30 to 40 minutes and it recorded using an audio tape recorder without harming their ethics. The interview data were transcribed for analysis and interpretation. The interview data were analyzed thematically, and three major findings were drawn. In order not to reveal the identity of the participants, pseudonyms were used.

ANALYSIS AND DISCUSSION

The qualitative analysis of interview data helped me to construct four themes associated with gender issues in teaching and learning mathematics. They are- lack of access and participation, lack of mathematical empowerment and low achievement of women in mathematics. Each theme has been analyzed and interpreted below.

Lack of Equal Access and Equal Participation

In relation to the theme associated with lack of equal access and participation, I asked the teacher participants about their views, *"How are the access and participation of female students in your college?"* The male teacher participant said, *"There is access but female student and teacher participation is low as compared to male in teaching-learning mathematics."* but the female teacher's answer was a bit different than that of the male teacher. She said, *"The ratio of female teacher and a female student is very low, the infrastructure like a classroom, toilet, etc. are not female friendly*". Then, I asked the same question to the female student and she answered, "*We have low access and there is not much female participation in class*". The male student said, *"There is the same access, but female student and teachers' participation is low."* Again, I asked, "*How are the female students and teachers treated?" The* male teacher and male student said, "*Good treatment*." The female student said, "*We respect our female teachers. But our male friends try to tease, rag and make fun of us and the female mathematics teachers as well*." The female teacher said, "*Students behave a bit funny and silly in the class. I must say, it's not that easy to motivate and bring them on track for the female teacher. The students show two different attitudes to the female and male teacher. One thing is that they underestimate and harass the female teachers giving them no respect at all. Another one is that some students are found giving due respect to female teachers as there is hardly any number of female teachers teaching mathematics".*

From the interview data and discussion in the literature, female teachers and students are not treated like male teachers. Although Iwu and Azoro (2017) believe that gender mainstream has led the women participation in science, mathematics, technology, and advanced studies, they are not provided opportunity to participate in teaching-learning mathematics whether it is in classroom activities for students or training for teachers. They are not getting equal access to and participation in teaching and learning mathematics. Girls are not active participants in mathematics due to the societal expectation (Ramu, 2014). Further, society does not have to

believe that female mathematics teacher and the student has a caliber in mathematics as mathematics is a historically male-dominated field. Even if equal access is provided, the environment is not female friendly which makes them demotivated for participation.

Lack of Mathematical Empowerment

Empowerment is a form of gaining power in particular domains of activity by individuals or groups and the processes of giving power to them, or processes that foster and facilitate their taking of power (Ernest, 2002). In this section, I questioned the teacher participant that, *"How do the family, society and the college management empower the female students to study mathematics?"* Both the male as well as female teacher's reaction was similar. She mentioned, *"From the side of the college management, there is an empowerment to students as the college focuses on bright future of the students, but there is no special orientation program about the importance of mathematics for female students. But, it is not positive in the case of family and society. Male dominant society and family does not encourage females to study mathematics."* I raised the question to the male student, "How well does your family, society, college management encourage you to study mathematics?" The male student said, *"We are encouraged to study mathematics but our female friends are not much encouraged".* The female student said, *"All of them said that mathematics is not subject for female, but I came here to study mathematics ignoring what they have said. It was my personal decision and self-empowerment to study mathematics".*

In this context, Sivakumar (2017) explained that in order to provide equal status in the society women need to be empowered. If women are empowered, then they can get equal opportunities as men. Paudel (2017) agreed that if women are empowered, they become independent to take decisions about their life. They can analyze the value of mathematics. In the discussion, it is seen that the empowerment for the girls is lacking. Even the male teachers and students agree that there are few empowerments for girls in teaching and learning mathematics. Thus, the issue regarding the lack of empowerment is seen in the case of mathematics teaching and learning from the interview participants.

Mathematical Achievement gap

The main focus in this section is in comparing male and female achievement gap in mathematics. For this, my questions to teacher participants were, "*What is the attendance condition of the girl students in a mathematics class? What are the pass percentage of girls' student and the scoring scenario? Do you perceive any differences between male and female capabilities in math*?" The male teacher replied, "*Attendance condition is good in female students, but their pass percentage is lower than the male students. I think the perceiving capability of the female is a little bit lower than that of males.*" The female teacher replied, "*Female students' attendance condition is good, but their pass percentage is lower than the male student. I think the perceiving capability of male as well as female is the same but due to the lack of*

encouragement, self-confidence, feminine problems, the females have lagged behind in perception." Then the questions to the student participants were, "*How regular do you attend your class? How is your academic performance? What is your further planning for the future?*" The male student replied, "*I am regular in my classes. My academic performance is quite sound. My future plan is to study masters, and then after, I want to apply for a job of mathematics teacher in a university.*" The female student replied, "*I try to attend my regular classes, but due to my personal causes I am not able to attend some classes. Sometimes, biological causes hamper my studies and academic performance. I have a plan to study masters, but there is still a question mark whether my family will allow me to do it or not.*"

Relating the issues that came from the interviews with literature, Pajares (2005) said girls report lower confidence than boys do in their math and science abilities. Similarly, Watt (2007) agrees that the gender difference in mathematics participation lies in the fact that girls have less confidence in their mathematical abilities than boys. In some ways, it may or may not be because of their birth or biological factors. Hall (2012) found that "females' attitudes toward mathematics and their mathematical self-concept was statistically significantly more negative than males', although males and females reported similar levels of understanding of the mathematics that was taught in class." These two reviews match with female participant's view. Gender gaps in relation to achievement and attitudes existed in the past and still exist in the present. While girls tend to score lower on standardized tests in mathematics than boys, the gap is not due to biological differences but because of socially constructed factors such as gender roles.

In the context of Nepal, NASA report (MOE, 2015), it is clearly seen that boys mean mathematics score is higher than girls. It is worth mentioning that all content areas of mathematics are dominated by boys. Similarly, NASA report (MOE, 2018) stated that the mean score of boys has been higher compared to mean score of a girl student in grade 8. The boy's students have achieved the mean score of 505 for boys and 495 for girls out of 550. Likewise, myself being a female mathematics teacher, I have experienced and coped with these sorts of challenges. Thus, the issue regarding the achievement gap is due to personal, family and the biological problem faced by a female in teaching-learning mathematics.

CONCLUSIONS

Women and men are biologically different but their roles, status, positions, responsibility are somewhat the same. In our male dominant society, there is a different way to see the female from the point of view of mathematics education. There is a belief that a female isn't able to grasp technical subjects such as mathematics, science and therefore is unable to teach and learn. While interacting with male and female teachers and male and female students in the university and summing up their view, I found this subject to be male dominant in the society. So, for the upliftment of women in society, we should focus on the issues that I have raised in this paper.

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