



GIRLS' ATTITUDE TOWARDS MATHEMATICS AT INTERMEDIATE LEVEL IN FATA

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Abstract:

This paper investigated the attitude of girls' students towards mathematics and factors affecting their attitude towards the subject at intermediate level in Federally Administered Tribal Area (FATA). The sample of the study was three hundred and thirty 330 pre-medical girls' students from six 6 higher secondary schools and inter-colleges in Khyber Agency. A convenience sampling technique was used in the selection of schools while students were randomly selected. Data were collected through a researcher-developed questionnaire with ($\alpha=0.97$) and were analyzed through descriptive statistics. Findings revealed that girls' attitude towards mathematics was negative. Socio-cultural factors, Stereotypic effects, math's anxiety, lack of role model in mathematics, deficiency of Mathematics teachers and lack of counseling services in schools/colleges were the main factors responsible for students negative attitude towards the subject. It was, therefore, recommended that revision of present math's course, introducing math's short courses, inclusion of description of the female role models in the subject, launching of effective awareness campaigns about mathematics career for girls, overcoming the deficiency of mathematics teachers in schools/colleges and establishing counseling services in schools/colleges were necessary for changing students' attitude to provide them opportunities to join science, technology, engineering and mathematics fields.

Key Words: Student's Attitude, Mathematics, Socio-Cultural, Awareness & Counseling.

Introduction:

Female gender is the significant part of population of Pakistan. Their participation in developmental activities of the country means accelerating the speed of progress. Pakistan is aware of the importance of girl student's role and has given equal opportunities to them to inculcate their abilities. Education policies in Pakistan encourage women to participate in the development of the country by acquiring education of modern Science and Technology as well. But unfortunately in the present scenario of Pakistan, the contribution of women to modern science and technology is very low as compared to their population. Their due participation in the fields of science, technology, engineering and mathematics can lead the country towards progress and prosperity. Mathematics is the key subject in these fields. According to Adesoji, (2008) there are many factors that could affect students' attitude towards science and mathematics. Some of them are teachers' attitude, parents influence and career interest. Understanding students' attitude is essential in supporting students' academic achievement and interest in a particular subject. Akey (2006), concluded that achievement in a subject depends upon the attitude towards that particular subject. The future generation needs such communities who are good in modern science and technology. Mathematics is important because it is a big part of life as well as basic sciences and everyone should know it. It has been observed that a lot of girls' students, nowadays, are losing interest in mathematics at intermediate level in FATA. For this purpose a study was conducted to investigate into the attitude of girl students towards mathematics as a subject and factors affecting it at intermediate level in FATA.

Statement of the Problem:

The purpose of the study was to investigate girls' attitude towards mathematics and factors affecting their attitude at intermediate level in federally administered tribal area (FATA).

Significance of the Study:

The female students of FATA, being a significant part of the nation, can play a vital role in the development of society. Imparting the education of science, technology and engineering to the students is a commitment in empowering them in different social and national back ground which will lead them towards economic development at grass root. To achieve this goal girls' enrollment in subject of mathematics must be increased. However, students' interest in a subject is the function of their attitude towards that subject.

After the conduction of this study, parents, teacher, school/college administration, curriculum planner and ministry of education will find a way out to tackle with math's-girl issue which will lead to increase their enrolment in mathematics at intermediate level. The government of Pakistan will take steps in order to ensure

girls' enrolment in the subject of mathematics as to provide opportunities to join STEM fields. The researchers will find new channels to investigate low enrolment and poor performance of girls' students in mathematics and other related subjects as well.

Objectives of the Study:

- ✓ To investigate the attitude of girls' students towards mathematics at intermediate level in FATA.
- ✓ To find out the effect of parents' role and socio-cultural factors on students' attitude towards mathematics.
- ✓ To evaluate influence of stereotype threat and math's anxiety on students' attitude towards mathematics.
- ✓ To check the effect of role model on students' attitude towards mathematics at intermediate level in FATA.
- ✓ To find out the effect of teachers and school/college administration on students' attitude towards mathematics.

Research Questions:

- ✓ What is the attitude of girls' students towards mathematics at intermediate level in FATA?
- ✓ Do parents' role and socio-cultural factors affect students' attitude towards mathematics?
- ✓ Do stereotype threat and math's anxiety affect students' attitude towards mathematics.
- ✓ Does role model affect students' attitude towards mathematics at intermediate level in FATA.
- ✓ Do teachers and school/college administration affect students' attitude towards mathematics

Review of Related Literature:

Students' Attitude:

Attitude is the way students behave and think. Attitude is not static because it can be changed depending on individuals (Siti Norliana 2008). Attitude can be positive or negative. Girl's students should be sensitized on value and importance of Mathematics (Owiti, 2001). In the research of Farooq & Zia (2008), it was concluded that attitude of both genders towards Mathematics is positive. The quantitative and abstract nature of mathematics can cause hesitation in majority of students especially when it is taught in class room (Musyoka, 2000).

Interest is the feeling to know and learn about something or someone. To girls other fields were more interesting than Mathematics (Preston, 2004). In some occupations beliefs play a vital role for success because girls and women who excel in Mathematics often don't pursue STEM fields (Eccles (2006). In early ages girls show less interest in mathematics or science careers than boys do (Lapan et al., 2000 & Turner et al., 2008. Most of the girls fail to participate in science and technology due to lack of confidence in mathematics (UNESCO, 2003). According to Mullis et al., (2000), females have negative attitude towards Mathematics, therefore show less interest in Math's.

Students come from different backgrounds. In some occupations parent cannot give due time to their children to help them to promote and facilitate their children's. Parental support and encouragement can put the child on the correct direction of his career (Catsambis, 2001). Some environmental factors that contribute to the gender related attitude about Math's such as parents and teachers which are held by students affect girls more than boys (Gunderson et al., 2011). Some factors like individual study, parent's role and socio-environmental factors had significant effect on education, decision and achievement in the Math's of young students (Jensen & Seltzer 2000). Parental and social attitude about math's class room experiences has effect on girls which cause them to feel that they are inferior to boys in Math's (Papanastasiou, 2000).

The reports of CAWMSET, (2000) & Reis, (2001), generally supported that parents and society are responsible for the lack of interest of girls in the subject of mathematics because they usually discourage girls from entering traditionally male-dominated STEM fields for which mathematics is compulsory at intermediate level.

Culturally described gender roles also affect occupational interests, (Low et al., 2005). After marriage it is considered shameful to continue math's related study in college with other male (Boado, 2000). Girls do not like STEM career because of responsibly at home (Shauman, 2003 & Mason et al. 2009).

Stereotype is an anxiety in which one observes another's actions through the lenses of a negative stereotype (Shairo & Neuberg (2007); Steele et al., (2006)). Women working in male's profession face negative stereotype considering that they are not real women. Teacher' and parents' own anxiety about Math's greatly influenced girls' attitude towards mathematics, including their stereotype and anxieties can transfer to girls and play a critical role in development of Math's attitude and interest in girls (Gunderson et al., 2011).

Girls usually lack confidence in Math's as compared to boys (Wermeer et al. (2000); & Casey et al, (2001)). Gender differences in self-confidence in STEM field subjects start in middle school and increase in high school and college with girls reporting less confidence than boys do in science and mathematics' abilities (Pajares, 2005).

The presence of female teacher greatly affects student's attitude and performance in subject (Boado, 2000). Women perform better on challenging math's tests when they come to know that a female has

constructed the test (Marx and Roman, 2002). By knowing about the role models of the same gender in specific fields the stereotype threat about girls in mathematics decreases because by seeing same group relieves the burden of these threats (Marx et al. 2005).

Teacher is responsible to control all classroom activities. If teacher is competent, having mastery over math's, having pedagogy, knowledge of students and knows how to motivate students towards math's it will affect students (Bransford et al. 2000). Students' attitude towards a subject was influenced by enthusiasm and effective teaching style (Bauer 2000). Teacher's attitude has strong effect on student's attitude about mathematics (Labudde, 2000). The quality of relationship between teacher and student has an effect on girl's attitude towards the subject which she wishes to study (Lee, 2002). It was also concluded that teachers' feeling and attitude about a subject can affect their students' feelings and attitude as well (Koch, 2005). The researches of Johns & Andy (2005), and McIntyre et al., (2003), showed that girls are not interested and do not give good performance in Math's due to the lack of role model in this subject at higher level.

School administration comprises of principal, vice principal and other staff. Most of the students are unaware of adequate information to prepare for further education according to their interest and aptitude and select a subject which can match their abilities and inclinations (Kurgat, 2005). School guidance program is keys to the success to the best choice of students' career (Maitra, 2007). Due to lack of guidance and counseling services, many students go and leave the school bearing no idea of the kind of job they should train for (Ndambuki & Mutie, 2007). The study conducted by Halima & Fatima (2012), concluded that there is lack of awareness and sense of significance in government schools on need of career counseling.

Research Methodology:

The study was a quantitative in nature for which a descriptive research design was used. The study was conducted in Federally Administered Tribal Area (FATA). The population of the study was eighteen (18) Girls' higher secondary schools and intermediate colleges in FATA. All Science students constitute the population of the study. Among eighteen (18) Girls' higher secondary schools and intermediate girls' colleges only six (06) schools and colleges were selected as sample of the study. From these targeted colleges and schools three hundred and thirty (330) Science students were selected in Khyber Agency and FR Peshawar. The selection of schools and colleges was convenience while students were randomly selected.

Data Collection Instruments:

The study was quantitative in nature, so self-administered questionnaire was developed for collection of data from female students. The questionnaires were divided into five major components. 1. Students' attitude. 2. Parents' and Socio-cultural role. 3. Role model effect. 4. Stereotype effect, math's anxiety and self confidence. 5. The role of school/college administration. The questionnaires were comprised of closed ended questions with five liker's scale options. The respondents were asked to tick the appropriate option among five (5) responses. Questionnaires were tested in pilot study at two colleges. The reliability was measured through Cronbach alpha test for which alpha coefficient value 0.97 was obtained. According to (Amin, 2005), validity is the extent of instruments that measures what it intends to measure. Data collecting instruments were developed under the close guidance and supervision of research experts to ensure content validity.

The collected data from students were analyzed by using (SPSS, version 16.0). For analysis of data percentage, mean and standard deviation were used and tables were prepared for illustration. The data were interpreted and discussed accordingly.

Results and Discussion:

Table 1: The attitude of students towards mathematics

(N=330)			
S.No	Statement	Mean	SD
1	Mathematics is a tough and laborious subject. I don't like it.	4.18	1.08
2	I can't study Mathematics at higher classes.	3.25	1.39
3	College math's has no practical use in my life.	3.00	1.29
4	Math's needs quantitative knowledge and skill which are not observed in girls.	3.52	1.38
5	Engineering degree needs hard work and enough time, I can't do it.	3.20	1.25
6	Math's related jobs are limited for girls.	3.50	1.18
7	I am not interested in Math's due to its abstract nature.	3.83	1.26

Table 1 shows that respondents are "Neutral" to the statement of item.3 "College math's has no practical use in my life" with M=3.00, SD=1.29, while the respondents are "Agreed" to the statements of items no.4, 5, 6 and 7 having different means and standard deviations which shows that students' attitude towards math's course, mathematics relative degree, mathematics relative jobs and its abstract nature is negative. However, the highest mean score 4.18 for the statement of item no.1 "Mathematics is a tough and laborious subject" indicates that the main cause of negative attitude is its tough and laborious nature. These results are in harmony to the findings of Owiti, (2001) and Mulli et.al., (2000) that girl's attitude towards Mathematics is negative while these were in disharmony to the findings of Farooq & Zia (2008), who concluded that attitude of

males as well females towards Mathematics was positive. The findings that girls attitude towards Math's related jobs in negative were supported by the findings of Baodo (2000), who found that Math's related jobs need enough time so students dislike time consuming courses. These results also support Musyoka (2000), who found that the quantitative and abstract nature of Mathematics can cause hesitation in majority of students especially when it is taught in class room.

Table 2: The role of parents and socio-cultural factors

(N=330)			
S.No	Statement	Mean	SD
1	At the time of admission, I was influenced by my parents.	4.20	1.12
2	I face restrictions from home on subject selection.	4.18	1.14
3	Home services and responsibilities lowered my math's choice.	3.76	1.41
4	Girls don't select Math's because they get married earlier.	3.98	1.24
5	Our society does not allow girls to do jobs in males dominated fields.	4.28	1.30

Table 2 shows that respondents are "agreed" with statements of items no. 3 and 4 "Home services and responsibilities" and "early marriage" having mean score value 3.76, 3.98 and SD 1.41, 1.24 respectively indicating that home services and responsibilities and early marriage affect their math's choice. The research conducted by Xu (2008), showed that the relationship between family responsibilities and Mathematics related careers is more nuanced. Also these results supported the findings of Boado (2000), that after marriage it is considered shameful to continue Math's related study in college with other male class-mates. However, the respondents of respondents are "strongly agreed" with statement of item no.1, 2 and 5 having the highest mean scores of M=4.20, 4.18 and 4.28 and SD=1.12, 1.14 and 1.30 respectively reflecting that the main causes of respondents negative attitude towards math's is the parents' influence, restriction from home on subject selection and socio-cultural constrains. These findings are in harmony to Papanastatiou (2000), who concluded that parental and social attitude about Math's has effect on girls which causes to feel that they are inferior to boys in doing Math's. Also these findings are in accordance with the findings of CAWSET, (2000) & Reis, (2001), which supported that usually society discourages girls from entering male dominated profession which are mainly mathematics related.

Table 3: Stereotype threat, Math's anxiety and self-confidence

(N=330)			
S.No	Statement	Mean	SD
1	Math's is males' subject, I can't take it.	2.02	1.20
2	Girls have usually weak base in mathematics.	4.21	1.17
3	Girls can't score in Mathematics like boys.	2.92	1.34
4	I feel anxiety about doing Mathematics.	4.18	1.18
5	I have no confidence in doing mathematics.	3.50	1.18

Table 3 shows that respondents are "disagreed" to the statements no.1 and 3 with mean scores values 2.02 and 2.92 and standard deviation 1.20, 1.34 respectively, indicating that math's choice has nothing to do with feminism and girls can study and score in mathematics like males. The responses of respondents to the statements of item no.5 "I have no confidence in doing mathematics" fall in the category "agreed" having M=3.50, SD=1.18, which shows that respondents have confident in doing mathematics. These results are in support to the finding of Pajares (2005) that gender differences in high schools and college increase with girls reporting less confidence in Math's. The results also support the findings of Casey et al, (2001) & Wermeer et al., (2000), that girls usually lack confidence as compared to boys and have anxiety about Math's. The responses of the respondents to the statement of item no.2 "Girls have usually weak base in mathematics" with the highest Mean=4.21 and SD=1.17 reflects that stereotype effect exist among the girls. The responses to the statement of item no.4 "I feel anxiety about doing Mathematics" with the second highest mean scores 4.18 and standard deviation 1.18 falls in range "strongly agreed" reflecting that respondents have math's anxiety. These findings support the research conducted by Gunderson et al., (2011) that teachers and parents' own anxiety influence girl's attitude about Mathematics.

Table 4: Role Model's effect

(N=330)			
S.No	Statement	Mean	SD
1	There is no female role model in mathematics, I don't like it.	4.20	1.27
2	School/College math's curriculum does not motivate girls towards higher studies.	3.92	1.31
3	Engineering/ Math's related jobs don't suit girls.	3.34	1.35

Table 4 indicates that the responses of the respondents to the statements of item no.2 "School/College math's curriculum does not motivate girls towards higher studies" with Mean=3.92, SD=1.31, fall in the category "Agreed" shows that math's curriculum is one of the causes of negative attitude of the respondents. Also the responses of the respondents to the statement of item no.3 "Engineering/ Math's related jobs don't suit

girls” falls in the range “agreed” with Mean=3.34, SD=1.35 also reflects the negative attitude of the respondents towards math’s. The highest mean score value for the statement of item no.1 “Since there is no role model in mathematics for girls so I dislike it” falls in the range “strongly agreed” with mean=4.20, SD=1.27, shows that the key cause of negative attitude of respondents towards mathematics is the lack of role model in mathematics for girls. These results supported the findings of Johns et al., (2005) and McIntyre et al., (2003) that girls are not interested and do not give good performance in Math’s due to lack of role model in this subject at higher level.

Table 5: The role of teachers and school/college administration

(N=330)			
S.No	Statement	Mean	SD
1	Female math’s teachers can teach mathematics effectively.	3.48	1.33
2	Female teachers encourage me to take Math’s.	1.18	1.24
3	I am fully satisfied with teaching method of female teachers.	3.49	1.25
4	Female math’s teachers have full command on Mathematics.	3.26	1.24
5	Subjection selection process is free and fair in this college.	3.14	1.27
6	Our School/college has deficiency of math’s teachers.	4.13	1.40
7	Our School/college don’t provide counselor to students.	4.24	1.18
8	I don’t know the future of math’s because I have no counselor.	4.25	1.25

Table 6 shows that respondents are “Agreed” to the statements of items no.1, 3 and 4 with Mean= 3.48, 3.49, 3.26 and SD= 1.33, 1.25 and 1.24 respectively, indicating that there is no flaw in the methods of teaching of math’s teachers which cause the negative attitude. The highest mean score for the statement of item no.2 “Female math’s teachers encourage me to take Math’s” was recorded with Mean=1.48, SD=1.24, falls in the range “strongly disagreed” reflecting that respondents have borrowed negative attitude towards mathematics from the attitude of mathematics teachers. These findings support the results of Labudde (2000) and Adesoji (2008), that teacher’s attitude has strong effect on student’s attitude towards Mathematics. Lee (2002) in his research argued that the quality of relationship between teacher and student has an effect on boy’s and girl’s attitude towards the subject which he/she wishes to study. According to Bransford et al.,(2000), if teacher is competent, having mastery over Math’s, having pedagogy, knowledge of students and knows how to motivate students towards Math’s it will affect students. While the responses of the respondents to the statements of items no. 6, 7 and 8 are “strongly agreed” with Mean scores= 4.13, 4.24 and 4.25 respectively, shows that school/college administration is the main cause of negative attitude of the respondents towards mathematics. In a research Muti (2005), argued that performance of a student depends on management style of the head teachers to motivate students towards Science and Mathematics. These results are in harmony to the findings of Ndambuki & Mutie (2007) that due to lack of guidance and counseling services, many students go and leave the school bearing no idea of the kind of job they should train for. These results also support the conclusions drawn by Halima & Fatima (2012), that there is lack of awareness and sense of significance in government schools on need of career counseling.

Conclusions:

On the basis of findings of the study the following conclusions were drawn.

- ✓ It was concluded from the findings of the study that respondents’ attitude towards mathematics course, related degree and related jobs was negative.
- ✓ Majority of the respondents agreed that parents’ role, home responsibilities and early marriage hinder the choice of mathematic at college which caused respondents’ negative attitude towards mathematics.
- ✓ Maximum sample of respondents agreed that socio-cultural constrains are the significant factors that cause the negative attitude of respondents towards mathematics.
- ✓ It was concluded from the study that mathematics anxiety and stereotype effect existed among the respondents which were the main causes of negative attitude towards mathematics.
- ✓ It was concluded from the study that respondents lack confidence in doing mathematics.
- ✓ Majority of the respondents reported that due to present non-motivate math’s curriculum and lack of female role model in mathematics career the respondents’ attitude was negative.
- ✓ Most of the respondents were of the views that the negative attitude is caused by the discouraging behavior of female math’s teachers towards mathematics.
- ✓ It is also concluded that deficiency of mathematics teachers as well as lack of counseling services in the school/college were the key causes of the negative attitude of the students towards mathematics.

Recommendations:

In the light of conclusion of the study the following recommendations are presented.

- ✓ Since the respondents’ attitude towards mathematics course, related degree and related jobs was negative, therefore it is recommended that to make their attitude positive, course short courses in mathematics should be introduced, present math’s course should be revised and new mathematics related jobs may be created for female.

- ✓ In order to cash the influence of parents on their daughters, parents' teacher counsel (PTC) should be strengthened and parents must be involved in subject selection process at school/college.
- ✓ Awareness campaign about math's career for girls should be launched to avoid negative attitude towards mathematics
- ✓ From the study it was concluded that Stereotype threat and math's anxiety about mathematics existed among the respondents. To minimize these stereotype threat and math's anxiety female teacher should be trained at primary level to inculcate in them positive attitude about mathematics.
- ✓ Due to lack of role model in mathematics, respondents' attitude is negative, it is therefore recommended to include the descriptions of female role models and scientist in math's curriculum to motivate them towards math's so that to provide them opportunities to join STEM career.
- ✓ Since the attitude of female math's teachers towards mathematics was also found negative, therefore it is recommended that special classes of refresher courses should be arranged for female teachers to promote positive attitude.
- ✓ It is also recommended that every school/college should be provided with enough mathematics teachers to overcome the deficiency of mathematic.
- ✓ Due to lack of counseling services girls are unaware of the math's scope so counseling services should be established from scratch in schools/colleges to promote positive attitude towards mathematics.

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