Exploring Gender Differences in Attitude towards Mathematics at Secondary Level in Pakistan

¹Tahira Batool, ²Sofia Akhter, ³Tahira Kalsoom

¹Research and Evaluation Department, Lahore College for Women University, Lahore Pakistan,
tahirashehbaz@yahoo.com

²Government School Education Department, Depalpur Pakistan

³Research and Evaluation Department, Lahore College for Women University, Lahore Pakistan.

ARTICLE DETAILS

History

Revised format: May 2019
Available Online: June 2020

Keywords

Attitude, gender difference, mathematics, secondary level

JEL Classification

M1, M12

ABSTRACT

This study was aimed to find out the attitude towards mathematics which were communicating gender difference among secondary level students. A quantitative research approach was used to explore gender difference in relation to the attitude towards mathematics among nine graders. Fifty seven public sector schools in Lahore were selected for this research. All nine graders in public sector secondary schools were target population of current study. Eleven hundred and eighty six students were selected through multistage random sampling for present research. A questionnaire developed by the researcher was used for exploration of gender difference in relation to students' attitude towards mathematics at secondary level in Pakistan. It was a Likert Scale with five points on it. The questionnaire was pilot tested and validated by experts. It was found that overall gender difference in attitude towards mathematics did not significantly exists. Therefore, the reason of difficulty in mathematics is needed to be explored for both boys and girls.

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Corresponding author's email address: tahirashehbaz@yahoo.com

Recommended citation: Batool, T., Akhter, S., and Kalsoom, T. (2020). Exploring Gender differences in attitude towards Mathematics at Secondary Level in Pakistan. *Journal of Business and Social Review in Emerging Economies*, 6(2), 587-596

1. Introduction

Attitude has a vital role in students' achievement in mathematical studies. Researches has shown positive attitude led towards success in mathematics. Effort to progress mathematics at lower secondary level offers base on upper secondary level mathematical achievements (Ma and Xu, 2004). Educational researchers have reported a considerable gender differences in students' attitude towards mathematics (Amalu, 2016; Boran, Aslaner & Cakan, 2013; Lee & Anderson, 2015; Yenilmez, & Ozabaci, 2003). But the perception about gender difference in attitude towards mathematics is going to be changed (Yasar, 2016). Mathematical studies has believed a central part in school education (Alenezi;

2008). So mathematics is an important subject for both boys and girls. A research on attitude of high school students in Mathematics has reported a positive trend in students' attitude in the direction of mathematics (Batoool, 2019). According to Yenilmez (2007) when students have negative attitude to mathematics they avoid mathematics and feel anxiety. Cockcroft (1982) reported some reasons why people should learn mathematics. He said it is useful for everyday life and provides a means to communicate, explain and predict. He further said that mathematics develops esthetic sense and logical thinking as well. Therefore, serious investigation is required to explore variables affecting mathematics performance in girls or boys at secondary level.

As suggested by Meece and Courtney (1992) that more research is needed to understand how variations on gender-role expectations and socialization experiences influence motivation and achievement patterns in students of different cultures. Therefore, this study was designed to explore difference in students' attitude towards mathematics due to their gender at secondary level in Pakistan.

2. Literature Review

At primary school level girls are time and again disappointed from their mathematical activities. Therefore, girls are not comfortable with mathematics at high school years and at university level girls often drop this subject. As a result, ladies are not employed at that job where mathematical expertise are required (Arnot, David & Weiner, 1996). Wasiche (2006) describes attitude as a feeling towards anything that is reflected in a peoples' behavior. Attitudes mostly depends on someone's personal experience in the learning environment. According to Orton (1987) mathematical abilities are not natural but these are acquired by a person. He further told some have natural characteristics and can develop mathematical abilities, though, he is not completely denying the genetic factor. It has already been recognized that many learners think mathematics as a boring subject for them (Brown, Brown, & Bibby, 2008). Moreover, Martin (2003) and Watt (2007) claims that there appears to be differences regarding gender in relation to attitudes towards mathematics and future aims. Mata, Monteiro, and Peixoto (2012) has inspected the outcome of individual and social support factors on attitudes towards mathematics in their research and found that, in overall, students thought positive attitudes towards mathematics. They also emphasized on grade and math achievement has effects on attitudes towards mathematics. Gender has no effect on these attitudes. Though, the girls showed a continuous weakening in attitudes as they proceeded in school. Ifamuyiwa and Akinsola (2008) has also examined moderating effects of locus of control and gender on senior secondary level students' attitude towards mathematics and found no significant main effects of gender on the participants' attitude towards mathematics. According to Farooq and Shah (2008) students' attitudes also influence the rate of response during the class lessons. They further told that positive attitude affect achievement positively.

They examined five factors in their research on a sample of 685 Pakistani students. These factors are confidence about mathematics, its usefulness as a subject, mathematics as a male domain and teachers' perception about students. They find out no notable difference regarding students' gender in this research. Furthermore, the analysis of overall data collected in this survey on attitude of secondary level students in Pakistan has exposed no difference in attitude due to students' gender. towards mathematics. They have concluded that male and female students in Pakistan have almost similar attitude towards mathematics. Therefore, the extent of students pass fail depends upon their attitudes in this subject. It was expressed that students' attitude towards mathematics may reflect teachers' attitudes for teaching mathematics. When the mathematics teacher feels that the subject consists of rote learning devoid of understanding, he/she would transmit these feelings to the students. In this way, students' feel that mathematics is a tough subject. As a result of this, the students don't effort to develop interest in it (e.g. Popoola & Olarewaju; 2010). There are different reasons of differences in attitudes due to gender. It is possible that any truly inclusive clarification might need to explain this complex mixture of factors. But, gender stereotyping is often mentioned as a possible reason of these differences, as it also shore up many other contextual factors like teacher, peer attitudes and parents approach that can effect boys and girls attitudes and class participation (Mael, 1998).

Ainley and Fordham (1991) have written for the beauty of school. They examined the pupil and teacher relationship. Based on the studies on attitudes towards mathematics, they established that pupil's gratification in school and their academic success are not connected with each other. Teachers of mathematics are also conscious about pupils' attitude connection with student's mathematical performance. Teaching and learning process of mathematics is closely related to the positive attitude towards mathematics. Another ingredient for mathematical education is confidence on this subject. Students having positive attitude towards mathematics usually enjoy mathematical works but it does not mean that they are positively confident in all the area of Mathematics (Robson, 1996). Nüket Elçi (2017) has investigated attitudes and its impact on teaching approach in mathematics. His research has shown gender related differences in individuals' attitude. He also discussed the wrong way of assessment in mathematics also confuse students which leads to the negative attitudes. Students feel that confusing formulations were at the heart of mathematics. Therefore, their attitudes are not improved in Mathematics.

Likewise, in particular differences in attitudes towards learning due to gender are recent trend in the literature in educational studies (Mata, Monteiro, & Piexoto; 2012). It is well thought out that boys' achievement and attitudes towards mathematics is better than girls. But conflicting to this concept, some investigators has shown that achievement do not differ considerably among girls and boys in mathematics (e.g., Lindberg, Hyde, Petersen, & Linn, 2010; Scafidi & Bui, 2010). The similarities in performance of boys and girls is also reported by Lindberg, Hyde, Petersen, & Linn, (2010) in a meta-analysis of data collected from 12860350 students in 242 different studies. They found that there were no noteworthy gender differences in both male and female learners' performance. Kaur (2017) has examined five dimensions of attitude towards mathematics in her study. She also explored gender difference in self-confidence, usefulness and motivation in her research, she found no difference regarding students' gender in this research. Kaur found that male and female nine graders in sample of this research has similar attitude towards mathematics.

Many students discover their ability in mathematics as boring and frustrating activity (Brown, Brown, & Bibby, 2008), and for mathematics Watt (2004) has also shown in his study decline of attitude as they grow up in school. Researchers should play a role in developing new understandings and investigating ways to recover the learning of mathematics. Avoidance is a rising issue in teaching and learning of mathematics (Ashcraft & Moore, 2009). Students love mathematics but after failure in this subject their point of view changed. Therefore, failure in mathematics leads towards negative attitude. Attitude of pupils' contribute a lot in development of pupils awareness about mathematical learning. It improves the adaptability and applicability in the students (Batool, 2019; Schiefele & Csikszentmihalyi, 1995). Parents can also play a role in student attitude during curricular and co-curricular activities (e.g. Batool & Raiz, 2019; Batool & Raiz, 2020). Present study was focused to see attitude towards mathematics in relation to gender differences among students at secondary level in Pakistan.

3. Research Questions

Main question of the study is;

- Q What is gender difference in students' attitude towards mathematics?
- a. Is gender difference exist in students' liking of mathematics?
 - b. Is there any difference exists due to gender in students' confidence to Mathematics?
 - c. Is there any difference regarding students' views about Mathematics as a subject exist due to gender?
 - d. Are students' views about Mathematics class different due to their gender?
 - e. Are students' views about Mathematics examination different due to their gender?
 - f. Are students' views about sources of seeking help different due to their gender?

- g. Are students' overall attitude towards Mathematic different due to their gender?

4. Methodology

4.1 Population and Sample

Students of all public sector secondary schools of boys and girls in Lahore were population of this study. By random sampling 57 Government high schools were selected, from which 1186 grade nine students (62% boys and 38% girls) participated in this study. Only grade nine students (mean age =15 years) in selected schools were target population of current study.

4.2 Research Instrument

In order to explore difference due to gender in nine graders' attitude towards mathematics, a questionnaire was developed on the basis of these points, students' liking of mathematics, confidence towards mathematics, and students' views about mathematics as a subject and mathematics classes and examination, students' sources of seeking help in mathematics. Before final use, instrument was pilot tested and reliability coefficient for final draft were found to be .69 for students' liking of mathematics, .58 for confidence towards mathematics, .78 for students' views about mathematics as a subject and .79 for mathematics class and .71 for examination, .56 for students' sources of seeking help in mathematics. Reliability coefficient for overall questionnaire was found 0.89. It was basically a Likert Scale with five points on it. The questionnaire was consisted on thirty eight items. Cronbach alpha for the scale was encouraging which is considered very suitable (Linn & Gronlund, 2000). Questionnaire was validated by a panel of experts.

4.3 Research Design

The study was exploratory research in nature. Quantitative research approach was used to examine the differences among groups (both male and female). The survey method was followed to examine the gender differences in attitude of secondary level students towards mathematics.

5. Results

Data collected were on a scale from 1186 participants. After that data were analyzed by using SPSS Version 16. Following results were obtained by comparing the means of groups with help of independent samples t-test. It was appropriate measures to find difference among groups.

Table 1
A Comparison of Boys and Girls (students) Liking of mathematics

Statements	Gender	Yes	No	Value χ^2	Df	Sig
I like mathematics because I am good in it	Male	379	341	5.47	5	.263
	Female	239	211			
I like mathematics because I know its logics	Male	323	221	.377	3	.957
	Female	198	219			
I like mathematics because I have a good mathematics teacher	Male	309	401	.346	2	.849
	Female	198	247			
I have constantly liked mathematics	Male	266	405	2.68	2	.351
	Female	139	295			
I like it because mathematics is helpful in my life	Male	201	531	3.733	2	.194
	Female	100	345			
Mathematics can help me in my job in future	Male	288	440	.101	2	.951
	Female	179	263			
I often get good grades in this subject	Male	315	417	.162	2	.922
	Female	189	256			

Table above indicates that there was no noteworthy difference in boys and girls (students) liking toward

mathematics. Both male and female students have similar attitude regarding liking towards mathematics. They feel mathematics will not help in career and future. They could not get good marks, both boys and girls were agreed on.

Table 2
A Comparison of Boys and Girls (Students) Confidence towards Mathematics

Give your opinion	Gender	St Ag	Ag	N	D Ag	St DAg	Value χ^2	Df	Sig
I am confident in mathematics	Male	319	145	121	57	87	2.481	6	.871
	Female	205	91	67	26	52			
Mathematics is too abstract for me	Male	157	87	145	189	144	6.56	6	.364
	Female	110	68	76	100	85			
I am getting worse in mathematics	Male	138	106	170	162	144	15.57	6	.024
	Female	117	76	92	79	72			
I feel I am coping well	Male	176	129	147	147	128	6.203	6	.287
	Female	119	61	82	88	89			
Mathematics classes are boring	Male	313	115	117	61	123	4.911	6	.427
	Female	201	71	59	47	62			

Table above indicates that no noteworthy difference in girls and boys (students) confidence towards mathematics. Only the statement in which it is asked that they are getting worse in mathematics has a significant gender difference. So, there is no gender difference regarding students' confidence towards mathematics.

Table 3
A comparison of girls and boys (Students) Views on Mathematics as a subject

Statements	Gender	St Ag	Ag	N	D Ag	St DAg	Value χ^2	Df	Sig
Mathematics is an abstract subject	Male	392	147	17	67	81	13.447	6	.017
	Female	177	82	27	68	61			
Mathematics is a difficult subject	Male	129	106	120	139	211	6.26	8	.619
	Female	76	80	77	75	124			
Mathematics is unrelated to life	Male	99	106	190	97	229	4.68	6	.580
	Female	59	64	100	56	156			
Mathematics is a boring subject	Male	72	96	171	130	231	1.453	5	.920
	Female	39	57	98	77	152			
Mathematics is not useful for career	Male	128	139	107	101	253	2.268	5	.512
	Female	63	89	63	71	154			
Mathematics is a complicated subject	Male	302	125	98	82	106	12.728	5	.026
	Female	141	55	60	71	102			

Table above point out that there is no noteworthy difference in girls and boys' (students) attitude towards mathematics as a subject. So, there was overall no difference due to their gender regarding students' views about mathematics as a subject. Both girls and boys (students) feel mathematics is a boring and difficult subject.

Table 4
A comparison of Girls and Boys (Students) View about Mathematics classes

Statements	Gender	Al	Oft	ST	Rar	Nev	Value χ^2	df	Sig
I do not understand what is taught	Male	227	111	218	45	125	7.619	5	.179
	Female	121	56	134	28	101			
I find doing mathematics problems repetitive	Male	136	192	250	71	72	6.502	5	.260
	Female	73	115	150	49	42			
The explanations are not clear	Male	136	194	250	71	72	6.567	5	.260
	Female	73	115	150	49	44			

It is difficult to be sure what is right to do	Male	95	146	285	104	71	12.45	5	.029
	Female	42	89	153	52	91			
I find I make many mistakes	Male	110	242	201	53	107	13.86	5	.018
	Female	42	101	111	117	96			
There is too much homework	Male	122	138	260	72	127	1.328	5	.923
	Female	71	77	156	49	85			

This table indicates that there is no noteworthy difference in (girls and boys) students' attitude towards mathematics classes. Only the statements in which it is asked that they are they are not sure what should do and they find they make many mistakes have significant gender difference. So, gender difference regarding students' attitude towards mathematics classes is not notable. Moreover, both girls and boys (students) cannot understand what is taught and feel difficulties in understanding explanations given in the classrooms. They also feel that homework is too much.

Table 5
A comparison of Students' View about Mathematics Examination

Statements	Gender	Al	Oft	ST	Rar	Nev	Value χ^2	df	Sig
Difficult problems make me panic.	Male	319	168	9	71	76	12.48	5	.036
	Female	105	101	137	31	63			
Examination need a lot of revision.	Male	182	200	68	68	70	5.48	6	.483
	Female	98	115	51	54	52			
I find in examinations I have deficiency of time	Male	115	130	301	91	74	3.94	6	.680
	Female	73	85	166	108	90			
I repeatedly make mistakes in examinations	Male	83	147	247	148	91	6.671	6	.587
	Female	47	72	165	98	51			
Remembering how to do things is difficult for me	Male	101	140	200	105	171	2.738	6	.841
	Female	55	91	120	61	108			
The opportunity in papers is very little to explain things	Male	145	93	162	136	174	6.983	6	.327
	Female	75	53	103	68	120			

From this table we can see that there is no noteworthy difference in (boys and girls) students' views about mathematics examinations. Only the statements in which it is asked that I tend to panic with difficult problems have significant gender difference ($0.036 < 0.05$). So, overall gender difference regarding students' views about mathematics examination is not significant. Both male and female students have shortage of time and make mistakes in mathematics examinations. Both have a little opportunity to explain things mathematics examinations.

Table 6
Comparison Girls and Boys (Students) Views about Sources of Seeking Help in Mathematics

Statements	Gender	Yes	No	Value χ^2	Df	Sig
I Practice mathematics problems till get the right solution.	Male	399	321	6.47	5	.263
	Female	219	221			
Carefully reading text books helps me a lot	Male	313	217	.317	3	.957
	Female	185	259			
Working with my friends is useful to understand the mathematical ideas.	Male	319	413	.326	2	.849
	Female	188	257			
My source of help is my parents in this subject	Male	415	276	2.40	2	.361
	Female	295	150			
Pictures or diagrams helps me a lot	Male	201	531	3.743	2	.154
	Female	100	345			
Learning the methods taught in class by my teacher	Male	440	288	.101	2	.951
	Female	263	187			
I have agreed in my mind what I have to do	Male	315	417	.162	2	.922
	Female	189	256			
I always try to get the right answer.	Male	283	449	2.449	2	.178

Table above point out that there is no noteworthy change in male and female students' sources of seeking help in mathematics studies. So, gender difference regarding students' sources of seeking help in mathematics studies is not significant. Both male and female students were agreed that practicing many mathematics exercise, reading text books carefully, working with friends and seeking help from parents is helpful. Similarly, boys and girls respond on the statements that learning the methods taught in class by my teacher and making sure to try to get the right answer.

6. Discussions

The study exposed that there is no noteworthy change in students' liking about mathematics in both girls and boys. Male and female students also has equal level of liking mathematics. There was same level of confidence towards mathematics for both groups of students. These results has accordance with study of Farooq & Shah (2008) and Kaur (2017). They have shown no gender difference in students' confidence in mathematics. The gender difference was not notable in case of students' views about mathematics classes and students' views about mathematics as subject. Both gender of students have same kind of opinion about mathematics at secondary level that is in line with the study of Lee and Anderson (2015). According to Amalu (2016) there was a major difference in boys and female students' thinking about mathematics as a complicated subject these results are in contrast with the current study.

The answer to the research question that "is difference in views about mathematics examinations exists in boys and girls at secondary level" is "no" in current study. Students' views about mathematics examinations in case of both boys and female students are almost the same (e.g. Schiefele & Csikszentmihalyi, 1995; Alenezi, 2008). Findings of current study has also shown that there is no major difference in students' sources of seeking help in both boys and girls. Both male and female students need same type of help. Both male and female student were seeking help by practicing many mathematics exercise and problem until they get them right answer and by reading their text books carefully. Seeking help is a form of feedback given by the helper (e.g. parents), so, they think feedback is helpful in achieving good grades for students (Batoool & Akhter, 2018; Batoool & Akhter, 2019). They were agree that following the methods taught by the teacher carefully was very helpful for them. In the same way, seeking help from their parents was found useful in their mathematical studies in both male and female students.

The findings of the study revealed that there is no noteworthy variation in students' attitude towards mathematics due to their gender. This is in line with the research finding of some previous researches (Alenezi, 2008; Farooq & Shah, 2008; Yasar, 2016; Kaur, 2017). At the last of this discussion we can say that there is a need of considering issues related to mathematics for both male and female students.

7. Conclusion and Recommendations

In the light of the findings of the current study gender difference in attitude towards mathematics is declining in grade nine students in Pakistan. But still there is need to explore gender differences regarding mathematics classes. Avoidance was an upward question in mathematics education (Ashcraft & Moore, 2009). There is need to find out difference regarding ability level of secondary level students attitude and other factors like giving feedback in mathematics (e.g. Batoool, 2020b). Students' self-efficacy and self-regulation is also a matter of consideration in students' mathematics achievement (e.g. Batoool, 2020a; Batoool, Noureen & Ayuob, 2019; Habiba, Batoool, & Ayesha, 2020). At upper school and university level this type of survey might be conducted to see a clear picture of gender differences regarding the attitude towards mathematics. Both Girls and Boys (Students) feel mathematics as a boring subject so there is a need to introduce new teaching techniques in mathematics learning. Students problems related to their memory or other health issue should also be explored because these variables may also affect attitudes (Batoool, Habiba & Saeed, 2019).

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