

## **Examining the Role of Attitude towards Mathematics in Students of Management Sciences**

<sup>1</sup>Muhammad Asif Tanveer , <sup>2</sup>Muhammad Rizwan, <sup>3</sup>Naeem Ali, <sup>4</sup>Muhammad Arif,  
<sup>5</sup>Umer Saleem, <sup>6</sup>Shaheer Rizvi

<sup>1</sup>Lecturer, Department of Management Sciences The Islamia University of Bahawalpur, Pakistan

<sup>2</sup>Lecturer, Department of Management Sciences The Islamia University of Bahawalpur, Pakistan

<sup>3</sup>Visiting Faculty, Department of Management Sciences The Islamia University of Bahawalpur, Pakistan

<sup>4,5,6</sup>Student, Department of Management Sciences The Islamia University of Bahawalpur, Pakistan

---

**Abstract:** *There is agreement in the literature that attitude play pivotal role in achievements and performance in mathematics. Moreover, mathematical skills are necessary in order to complete undergraduate program of business studies. Specially, students who are having major marketing, accounting and finance subjects cannot complete degree without possessing some mathematical skills and knowledge. The aim of this study is to investigate the relationship between gender, marks obtained in mathematics and overall CGPA in previous semesters, with students' attitude towards business mathematics. This empirical study is done through 18 items of attitude for business mathematics and demographic information of respondents and survey information is collected from 108 students of department of management sciences, The Islamia University of Bahawalpur. All the respondents have already passed out business mathematics course. In order to find out results descriptive statistics, ANOVA, and regression analysis employed. Results indicate that gender is not having significant impact on attitude for mathematics, male are slightly better than female. Higher achievements and grades increase the likeness of this subject. Surprisingly, students with higher CGPA are negatively inclined toward this course. On the average, students' performance in mathematics remains below part compared to other subjects results. There is importance for the universities and business schools to know that failure and lower inclination toward mathematics due to little achievements and inadequate exposure of this subject. At entry level, these institutions should ensure that students have necessary mathematical abilities and skills.*

**Key Words:** *Attitude, affect, cognition, mathematics, gender, CGPA, obtained marks, learning*

---

### **I. Introduction**

Attitude plays an important role in determining individual reaction to particular entity. Attitude shape the behavior, positive attitude leads towards favorable response and negative attitude develops unfavorable response. Attitude is usually classified in three different categories which are affect, cognition and behavioral intention. These three determinants confine the clear meaning of attitude. Attitude is one of the most pivotal determinants of achievement in academic career (Ma and Kishore, 1997). Attitude is all about someone liking or disliking of particular object. Studies show, as compared to male, females have less positive attitude for mathematics (Leder, 1995). This negative attitude tends to increase, as student move towards higher education (Hannula, 2002).

Attitude towards Business mathematics measure the level of affect and emotions, students have for this subject (Di Martino and Zan, 2001). According to Ayub et al (2005), when studying mathematics, affect means optimistic or pessimistic feeling towards mathematics. Cognition means that how student perceive to mathematics, their perception is regarding the usefulness of mathematics in daily lives and practical implications in businesses, while behavior or intention deals with reaction of student towards mathematics. Mathematics is supposed to be taught at BBA level, so there are chances that they may have developed some attitude this subject. It will be easier to forecast the behavior and performance of student towards mathematics if we are having information about attitude for mathematics.

This research intended to examine the impact of attitude on students' performance in business mathematics. Grades in this subject may determine success. Those students, who are more anxious and less affection for mathematics, are likely to exhibit negative attitude and will feel discomfort to teach and learn it (Ho., et al, 2000). Attitude of students regarding mathematics and quantitative subjects become positive, as they pass through different semesters and curriculum. Similarly, students feel that mathematics little a bit more difficult than other quantitative

subjects like statistics. Moreover, some talented students also detract other and themselves by showing some negative attitude for this course. Negative attitude towards business mathematics become even more negative if students have not studied mathematics at secondary education level.

The Islamia University of Bahawalpur located in Southern Punjab, Pakistan. Department of management sciences is an integral part of this university. Most of students of this department come from government schools and colleges, who face serious deficiencies in quantitative subjects. Similarly, Most of students who take admissions at undergraduate level program come without mathematical background. Therefore, it is general to possess negative attitude for business mathematics. But, this study tries to find out attitude of those students who have studied business mathematics and also passed out it. The paper investigated the different variables that might develop positive attitude for this subject like role of gender, obtained marks in business mathematics, and overall CGPA using SPSS, regression, ANOVA, and descriptive techniques. This study designs to investigate if there is noteworthy difference in the attitude of business students towards mathematics in relative to gender. Students who have got higher marks compared to who have not. This study will also develop the relationship of better marks obtained in other subjects may help to attain similar achievements in business mathematics.

## **II. Related Literature Review**

There are many factors which have direct influence on achievements and performance of business mathematics, these are attitude, anxiety, ability and mathematical background. In context of Pakistan, There are scarce studies have been conducted on student attitude towards business mathematics. In many studies, it is indicated that student are witnessed about having positive attitude and mathematical achievements (Gallagher & De Lisi, 1994; Orhun, 2007). According to Shashaani (1995) attitude of student contributes major part in determining attainment and partaking mathematics. Similarly, Thondike-Christ (1991) revealed that mathematics grades determine interest level and intention of student to study quantitative subjects in future education.

According to Burstein (1992) student attitude towards mathematics and their performance and achievements are directly related with each other. Therefore, those students are having positive attitude perform better than bearing negative attitude regarding mathematics (Gibbons et al, 1997). To teach business mathematics, attitude has to be assessed, as it is having high importance to teach this subject (Tapia and Marsh, 2004).

Linn and Hyde (1989) pointed out that stronger affection with mathematics have greater upshot on mathematics partaking than those students, who are showing higher cognition level. The learning of business mathematics depends upon attitude and affection level (Meyer & Koehler, 1990). Attitude is the most important determinant to create higher interest level of student for business mathematics. In the light of above literature, it is important for instructor of business mathematics to make classroom environment where students possessing positive attitude (Steinback & Gwizdala, 1995; Ayub et al, 2005).

Lester et al (1989) and McLeod (1992) pointed out that teachers can easily predict the students' performance and results of business mathematics by analyzing their affection level with this subject. Similarly, by observing and students comments about this subject, whether they like it or not, make easier for teachers, how to teach this subject and provide more learning for students. Positive attitude for business mathematics is very important. Positive attitude increases student's learning of mathematics (Neale, 1969). Positive attitude associated with improved performance and achievements. Positive attitude regarding mathematics will encourage business students to choose finance and quantitative subjects (Haladyna et al., 1983).

From above discussion, it looks like that attitude is decisive variable for better performance and achievement in mathematics. But, there are many studies which are suggesting that gender is also having important part for success in mathematics (Fennema & Sherman, 1976; Badger, 1981; Galbraith & Haines, 1996). There are general perceptions and findings of many researches that male can perform better than females (Beswick, 2007). Some studies also indicate that girls are having more dominance in mathematics results (Stockard and Wood, 1984; Galbraith & Haines, 2000; Tressou-Milonas, 1990). But, Shuard (1982) found that there is no difference in the achievement of boys and girls, when they are studying mathematics.

If we analyze the different aspects mathematics achievement and gender, according Hyde et al (2008) females are sharper in computation than male, while male are having dominance in problem solving. Females feel more comfort and perform better, when they are solving class room and text problems. On the other hand, males show better result with non text and non routine mathematics (Harris, 1999; Linn and Kessel, 1996). But, it is observed from over the year's researches that there is very small and less significant difference in the performances of male and female, and this difference have decreased further with passing years (Friedman, 1989; Hyde et al 1990).

Cognitive function, environment and behavior are key ingredients of learning. According to Kirton (2003) there are three cognitive functions involved in problem solving and individual learning, these are cognitive affect, cognitive resource and cognitive effect. Cognitive affect relates with motivation, needs and wants, and values which enables the person to achieve something. Cognitive effect reminds us about person capabilities and learning ways. Cognitive resource is person ability, knowledge and experiences. All these cognitive variables operate in environment which means climate, culture and interaction with other. In study prospective, it means class setting, teaching methodologies and interaction with students.

There are many studies which have explored the role environment on learning. Students get maximum leaning and develop positive attitude toward a subject in a climate where student get higher involvement, teacher-student relationship, and creative teaching methodology. There is positive correlation among upshots and perceptions about attitude (Fraser and Fisher, 1982). In order to provide maximum learning, there should be an environment, where student feel comfort, motivation, and experimentation in the classroom. Attitude has positive impact on student motivation, it eventually generates fruitful results.

Teaching style and content of course have positive influence on learning and achievement in mathematics. Instructional methods and lacking in-depth understanding of mathematical concepts create problems and unable to trace out the importance of mathematics in their lives (Crespo, 2003). In management sciences, this subject considers to impractical and irrelevant (Nardi and Stewart, 2003). When students are inexperienced, fewer students are getting good marks and teacher is not delivering knowledge effectively create difficulties to attain desire results. Teachers who feel greater self efficacy, and set higher goals and objectives for themselves and their students can tackle obstacles and problems successfully (Ross and Bruce, 2007). Teacher should engage students with practical learning and provide some real-world applications (Cady & Reardon, 2007).

Student achievements enhance the level of affection with the particular subject. Some of studies recognize student affect and attitude for mathematics is developed through poor, excellent or average grade (Tapia & Marsh, 2001; Hannula, 2002). Increase in understanding of mathematics helpful for getting higher grades, resulted higher level of positive attitude. Self efficacy of students and attitude correlate with each other. Meanwhile, self efficacy in mathematics influenced through previous grades and marks (Lopez et al, 1997). Higbee & Thomas (1999) investigated that if student get interest in mathematics subject, he will eventually get better results. Therefore, student' attitude have impact on achievements. Hence, there is relationship between obtained marks in mathematics in previous exam and attitude toward this subject.

### **III. Methodology**

This study is carried on with the aim to measure attitude and interest of students toward mathematics from those students who have passed their mathematics subject, studied in initial semester. This study has been conducted in department of management sciences, the Islamia University of Bahawalpur, with 108 students from undergraduates program. In the sample size, all the students have already taken business mathematics course as well as they have passed out it. Survey was conducted in the class room with the willingness of students and approval of faculty members. Participants were not asked to put their name and roll number on the questionnaires in order to make sure this information will be anonyms. Students were asked to provide information about CGPA, marks obtained in mathematical course, and information about gender and age. Student attitude is measured through 5 points Likert scale; where 1 means strongly disagree, 2 disagree, 3 Neutral, 4 agree, and 5 stand for strongly agree. The information inserted in SPSS and data is analyzed through reliability, regression, ANOVA, and descriptive statistics. Results indicate that there is high reliability in the data. The researchers used 18 items to examine attitude of students and develop correlation with marks obtained, gender, and overall CGPA that particular student has achieved in the previous semesters.

### **IV. Results And Discussion**

The survey started with four questions about demographic information of participants which are gender, age, overall CGPA and marks obtained in mathematics. From the respondents, 53 were male and 55 were female respondents. A breakdown of responded grade level in the mathematics subject and overall CGPA is given in Table 1 and 2. In the Islamia University of Bahawalpur, students get 3 GPA attaining 70 marks, 3.5 after getting 77 marks, and 4.0 after getting 85 or plus marks. From table 1 and 2, it is clearly apparent, student of management sciences have shown less performance compared to overall marks and CGPA obtained. There are only 5 percent students, who have got more than 85% marks in mathematics, while there are 16 percent have achieved similar marks in overall result from previous semesters. Likewise, there are 45 percent who have secured less than 3.0 GPA in

mathematics compared to 34 percent in context of overall result. It means students from management have shown poor results in mathematics ( ).

**Table: 1 Frequency of Obtained Marks of Respondents**

Marks	Frequency	Percent	Valid Percent	Cumulative Percent
60-70	49	45.4	45.4	45.4
70-80	29	26.9	26.9	72.2
80-90	25	23.1	23.1	95.4
90-100	5	4.6	4.6	100.0
Total	108	100.0	100.0	

**Table: 2 Overall CGPA**

CGPA	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 3.0	37	34.3	34.3	34.3
3.0-3.5	54	50.0	50.0	84.3
3.5-4.0	17	15.7	15.7	100.0
Total	108	100.0	100.0	

In term of gender, there are some controversial findings. Some studies indicated that male have positive inclination toward mathematics, other studies favor female. There were also some studies which show there is no impact of gender on attitude towards mathematics. From Table 3 and 4, our findings suggest male have slightly positive relationship related to female. Mean score of male is 3.42 and 3.26 of female. Overall, it suggests that there is no significant relationship in gender and attitude towards business mathematics.

**Table: 3 Gender**

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Male	53	3.4220	.46086	.06330	3.2950	3.5491	2.32	4.05
Female	55	3.2612	.56595	.07631	3.1082	3.4142	2.00	4.05
Total	108	3.3402	.52095	.05013	3.2408	3.4395	2.00	4.05

**Table: 4 ANOVA**

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.698	1	.698	2.610	.109
Within Groups	28.340	106	.267		
Total	29.038	107			

In the table 5, 6 and 7 postulates the relationship of obtained marks and overall CGPA with the attitude of students towards mathematics. The relationship between obtained marks and attitude for business mathematics tested. Regression analysis from the table 7 shows sig. value 0.001 which is less than 0.005 (Beta = .435, sig. = 0.001<0.005). As coefficient is positive indicating that the greater the marks obtained in mathematics more positive

attitude towards business mathematics will be developed. Therefore, there is positive relationship in getting good marks and level of positive attitude. The data suggests significant and positive relationships exist. Results of this study are consistent with the previous studies.

Similarly, relationship of overall CGPA of students and attitude for business mathematics also examined. Regression analysis of these variables identifies sig. value 0.056 which is greater than 0.005 (Beta= -.249, sig.=0.056). Results clearly indicate coefficient is negative which means, as students get better CGPA, inclination and attitude towards mathematics will decreased. Consequently, there is negative relationship prevail between attitude towards business mathematics and overall CGPA.

**Table: 5 Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.317 <sup>a</sup>	.101	.083	.49875

a. Predictors: (Constant), Overall CGPA, Obtained Marks

**Table: 7 Coefficients**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.227	.137		23.579	.000		
	Obtained Marks	.244	.072	.435	3.376	.001	.515	1.941
	Overall CGPA	-.189	.098	-.249	-1.931	.056	.515	1.941

a. Dependent Variable: Attitude

**Table: 6 ANOVA<sup>b</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.920	2	1.460	5.869	.004 <sup>a</sup>
	Residual	26.119	105	.249		
	Total	29.038	107			

a. Predictors: (Constant), Overall CGPA, Obtained Marks

b. Dependent Variable: Attitude

The results confirm those males are slightly better than female for mathematical attitude, but there are no significant differences in term of impact of gender attitude of this unit. These results are opposite to Anderson et al (1994) and Lumsden and Scott (1987) findings. But, findings of this research consistent with Ellis et al (1998) and Stenberg et al (2010) studies This study confirms that better marks in mathematics in mathematics lead for more positive attitude and these results can be attained by exposing students to more mathematical courses and programs (Mallik & Varua, 2008). In addition, performance in other subjects is not related with performance business mathematics. Surprisingly, students with higher grades and CGPA have shown negative attitude. It means they may not be able to find out practical implications of this subject in their daily life.

## V. Conclusion

The basic questions of this study posed by authors relate to impact of gender, CGPA, and marks obtained in business mathematics at undergraduate level program in business administration to have outcomes for confirmation. At least in this study, students have exhibited neutral attitude towards mathematics. Male students are inclined slightly more compared to female, as for concern gender, no significant relationship found. Those students, who have got better marks in mathematics, have shown more positive attitude and affection for this subject. On the other hand, there is enveloping loathed and lower grads of mathematics subject as compared to other subject they have studied. This study has some implications and significance for teachers, students, and their parents. As study shows

achievements in mathematics creates positive attitude, teachers should focus on to increase the level of achievements in order to foster optimistic attitude. There are a lot of students who are not having mathematical background and abilities. Therefore, universities should make different policies for these students.

Moreover, there are some limitations of this research. Sample size was very small; it is also taken from one department of one university. Thus, results of this study cannot be generalized to other institutes. If the researcher wants to complete again, there should be some adding up to be made for further research. The researcher would gain more permission to conduct survey from other departments of same university or from additional universities in order to attain more sample size and valid research. Students who have not got good marks or failed in the subject can also be included. Future research can be done with some mediating and moderating variables in order to develop better relationship of attitude and performance in mathematics in management sciences. This study can also be converted into longitudinal study.

### References

- [1]. Anderson, G., D. Benjamin and Fuss, M. A. 1994, 'The determinants of success in university introductory 'economics courses', The Journal of Economic Education, vol. 25, no. 2, pp. 99-119.
- [2]. Ayub, Lian, and Mukti. (2005). Students Attitudes Toward Calculus: A Preliminary Study Among Diploma Students At Universiti Putra Malaysia. *Jurnal Teknologi (E)* ,42 (E). pp. 49-60. ISSN 0127-9696 .
- [3]. Badger, M.E... (1981). Why aren't girls better at Maths? A Review of Research. *Educational Research* 24(1) 11-23 .
- [4]. Beswick, K. (2007). Teachers' beliefs that matter in secondary mathematics classrooms. *Educational Studies in Mathematics*, 65(1), 95.
- [5]. Burstein, L. . (1992). The analysis of multilevel data in educational research and evaluation. . *Review of Research in Education*; 8, 158-223. Federal Republic of Nigeria 2004: National Policy on Education (Revised), NERC .
- [6]. Cady, J., & Rearden, K. (2007). Pre-service teachers' beliefs about knowledge, mathematics, and science. *School Science and Mathematics*, 107(6), 237-245.
- [7]. Crespo, S. (2003). Learning to pose mathematical problems: Exploring changes in preservice teachers' practices. *Educational Studies in Mathematics*, 52(3), 243-270.
- [8]. Di Martino, P. & Zan, R. . (2001). Attitude toward mathematics: some theoretical issues. *Proceedings of PME 25*, vol.3, 351-358, Utrecht, Netherlands .
- [9]. Ellis, Larry V.,Dunden,Garey,C. and Gaynor,Paricia E. (1998) Evidence of Factors that Influence Probability of Good Performance in the Principles of Economics Course, <http://www.westgate.edu/~bquest/1998>, accessed November 2009.
- [10]. Fennema, E., & Sherman, J. A. (1976). Fennema-Sherman mathematics attitudes scales; instruments designed to measure attitudes towards the learning of mathematics by females and males. . *Catalog of Selected Documents in Psychology*, 6(1), 31 .
- [11]. Fraser, B. and B. Fisher, (1982), "Predicting students' outcomes from their perceptions of classroom psychosocial environments," *American Educational Research J*, Vol.4, pp. 498-518.
- [12]. Friedman, L. Mathematics and the gender gap: A meta-analysis of recent studies on sex differences in mathematical tasks. *Review of Educational Research*, 59(2), 1989, pp. 185-213.
- [13]. Galbraith, P. L. and Haines, C. R.: 1996, 'Student perceptions of computing, mathematics, and their interaction', in: C. Keitel, U. Gellert, E. Jablonka and M. Muller (eds.), " *Mathematics (Education) and Common Sense*, Proceedings of CIEAEM 47 Berlin 23–29 July 1995, pp. 290–296.
- [14]. Gibbons, S; Kimmel, H and O'Shea, M. (1997). Changing teacher behaviour through development: Implementing the teaching and content standards in science. *School Science and Mathematics*; 97(6), 302-310 .
- [15]. Hannula, M. (2002). Attitude toward mathematics: emotions, expectations, and values. *Educational Studies in Mathematics*, 49, 25-46.
- [16]. Harris, M. B., & Schau, C. (1999). Successful strategies for teaching statistics. In S. N. Davis, M.Crawford, & J. Sebrechts (Eds.), *Coming into her own: Educational success in girls and women* (pp.193–210). San Francisco: Jossey-Bass
- [17]. Higbee, J.L., & Thomas, P.V. (1999). Affective and cognitive factors related to mathematics achievement. *Journal of Developmental Education*, 23(1), 1-15.
- [18]. Ho, H., Senturk, D., Lam, A.G., Zimmer, J.M., Hong, S., Okamoto, Y., Chiu, S., Nakazawa, Y., & Wang, C. (2000). The affective and cognitive dimensions of math anxiety: A crossnational study. *Journal for Research in Mathematics Education*, 31(3), 362-379.
- [19]. Haladyna, T., Shaughnessy, J., Shaughnessy, M. (1983). A causal analysis of attitude toward Mathematics. *JRME*, 14 (1), 19-29 .
- [20]. Hyde, J.S., Fennema, E., Ryan, M., Frost, L.A., & Hopp, C. (1990). Gender comparisons of mathematics attitudes and affect: A meta-analysis. *Psychology of Women Quarterly*, 14(3), 299-324.
- [21]. Hyde, J. S., Lindberg, S. M., Linn, M. C., Ellis, A. B., & Williams, C. C. (2008). DIVERSITY: Gender similarities characterize math performance. *Science*, 321, 494–495. doi:10.1126/science.1160364.
- [22]. Galbraith, P. and Haines, C. (2000). *Mathematics-computing Attitudes Scales*. Monographs in Continuing Education. London: City University.
- [23]. Kirton, M.J., (2003), *Adaption-Innovation In the Context of Diversity and Change*,Routledge, NY.
- [24]. Leder, G. C. and P. Taylor . (1995). Gender and mathematics performance: A question of testing? In: B. Grevholm and G. Hanna (eds.), *Gender and Mathematics Education: An ICMI Study in Stiftsgarden, Akersberg, Hoor, Sweden*, 1993 (pp. 271-280). Lund; Lund Uni.
- [25]. Lester, F. K., Garofalo, J. & Kroll, D. L. . (1989). Self-Confidence, Interest, Beliefs, and Metacognition: Key Influences on Problem-Solving Behavior. . In D. B. Adams, *Affect and Mathematical Problem Solving* (pp. 75-88). New York: Sp.
- [26]. Linn, M & Hyde, J. . (1989). Gender, mathematics, and science. . *Educational Researcher*, 18(8), 17-19, 22-27.
- [27]. Linn and C. Kessel, (1996) "Success in Mathematics: Increasing Talent and Gender Diversity among College Majors," *CBMS Issues in Mathematics Education*, 6 (1996) 101–144.
- [28]. Lopez, F., Lent, R., Brown, S., & Gore, P. (1997). Role of socio-cognitive expectations in high school students' mathematics-related interest and performance. *Journal of Counseling Psychology*, 44(1), 44-52.

- [29]. Lumsden, K.G and Scott , A. 1987, 'The economics student re-examined: Male-female differences in comprehension', *Journal of Economic Education*, vol. 18, pp365-375.
- [30]. Ma, X., & Kishor, N. . (1997). Assessing the relationship between attitude toward mathematics and achievement in mathematics: A meta-analysis. . *Journal for Research in Mathematics Education*, 28(1), 26-47 .
- [31]. Mallik, G. and Varua, M. 2008, 'HSC mathematics results and tertiary success in quantitative units: an Australian experience', *Australasian Journal of Economic Education*, vol. 5, nos. 1 & 2, pp. 1-10.
- [32]. McLeod, D. (1992). Research on affect in mathematics education: a reconceptualization. In D.Grows, *Handbook of Research on Mathematics Teaching and Learning* (pp. 575-596). New York: McMillan Publishing Company.
- [33]. Meyer, M. R., & Koehler, M. S. (1990). Internal influences on gender differences in mathematics. In F. & Leder, *Mathematics and Gender* (pp. 60-95). New York: Teachers College Press.
- [34]. Nardi, E., & Steward, S. (2003). Is mathematics T.I.R.E.D? A profile of quiet disaffection in the secondary mathematics classroom. *British Educational Research Journal*, 29(3), 345. Retrieved from Academic Search Premier database April 8, 2010.
- [35]. Neale, D. (1969). The role of attitudes in learning mathematics. . *The Arithmetic teacher*, Dec. 1969, 631-641.
- [36]. ORHU.N. (2007). An investigation into the mathematics achievement and attitude towards mathematics with respect to learning style according to gender. *International Journal of Mathematical Education in Science and Technology*, Vol. 38, No. 3, 15 April 2007, 321–333
- [37]. Ross, J., & Bruce, C. (2007). Professional development effects on teacher efficacy: Results of randomized field trial. *The Journal of Educational Research*, 101(1), 50-60.
- [38]. Shashaani, L. (1995). Gender differences in mathematics experience and attitude and their relation to computer attitude. *Educational Technology*. 35(3), 32-38. .
- [39]. Shuard, H. B. (1982). Differences in mathematical performance between girls and boys. In *Cockcroft Report*.(1982). *Mathematics counts: Report of the Committee of Inquiry into the Teaching of Mathematics in Schools under the chairmanship of W. H. Cockcroft* (pp. 273-287). London: HMSO.
- [40]. Stenberg, L., Varua, M. E., & Yong, J. (2010). Mathematics aptitude, attitude, secondary schools and student success in quantitative methods for business subject in an Australian Catholic university experience. Paper presented at the 39th Australian Conference of Economists. Sydney, NSW, 27-29 September.
- [41]. Stockard, J., & Wood, J. W. (1984). The myth of female underachievement: A reexamination of sex differences in academic underachievement. *American Educational Research Journal*, 21, 825–838. doi:10.2307/1163004.
- [42]. Steinback, M., and Gwizdala, J. (1995). Gender differences in mathematics attitudes of secondary students. . *School Science and Mathematics*, 95, 36-41 .
- [43]. Tressou-Milonas, E. (1990). True or false: primary school girls do badly at maths. In L. Burton (Ed.), *Gender and Mathematics: an international perspective* (pp. 113 - 118). Cassell Educational Limited
- [44]. Tapia, M. & Marsh, G. E. (2001). Effect of gender, achievement in mathematics, and grade level on attitudes toward mathematics. Paper presented at the Annual Meeting of the Mid-South Educational Research Association. Science, Mathematics, and Environmental Education, 1-20.
- [45]. Tapia, M. & Marsh II, G. E. (2004). An instrument to measure mathematics attitudes. *Academic Exchange Quarterly*. 8(2), 130-143 .
- [46]. Thorndike-Christ, T. . (1991). Attitudes toward mathematics: Relationships to mathematics achievement, gender, mathematics course-taking plans, and career interests. WA: Western Washington University (ERIC Document Reproduction Service NO. ED 347066).