

ACHIEVEMENT IN MATHEMATICS OF ADOLESCENTS IN RELATION TO PARENTAL INVOLVEMENT, CLASSROOM ENVIRONMENT AND ATTITUDE TOWARDS MATHEMATICS

Dr. Kiranjit Kaur

Associate Professor, Dev Samaj College of Education, Chandigarh

ABSTRACT

Many factors are responsible for Students' achievement in mathematics. The present study was based on a survey of 925 secondary school students about their mathematics achievement, parental involvement classroom environment, attitudes towards mathematics. Sample of the study was adolescents selected randomly from 10 private and 10 government schools of Chandigarh. Classroom environment Scale developed by Moos and Trickett (1987) and Parental Involvement Scale and Mathematics Achievement test developed and standardized by the investigator and a scale prepared and standardized by the investigator to examine the attitudes of students towards mathematics at secondary school level were used. Bivariate Correlation coefficients between criterion variable of achievement in mathematics and other predictor variables under study were calculated. Multiple Correlation and Multiple Regression techniques were employed for predicting the contribution of three variables to the variance in achievement in mathematics.

Key words: *Mathematics achievement; parental involvement; classroom environment; attitudes towards mathematics.*

INTRODUCTION

Mathematics is the language of all sciences and is essential for thought, logical reasoning and progress. It releases the mind and also gives individuals an appraisal of the intellectual abilities by pointing towards course of improvement. It is the basis of all sciences and technology and

therefore of all human endeavors (Aminu, 1990). Mathematics is a subject which provides basis directly or indirectly to almost all subjects. A bank of mathematical brain would help the rational and scientific growth of any society. All scientific education is based on mathematics. Its neglect means to remain ignorant about all the advancements. The knowledge of mathematics is indispensable for a wide variety of professions (Bala, 2006).

In the last half century, parents' role in the educational process has gained interest and national focus from policymakers, educationists, and researchers (Hawes & Plourde, 2005). Of concern and an area where the least amount of research has been conducted is parental involvement with higher secondary school adolescents (Epstein & Sheldon, 2002). Parental involvement in educational research has mainly been focused on elementary grade levels (Chen & Gregory, 2009) and shown positive correlations to improved achievement (Anderson & Minke, 2007; Catsambis, 2001; DePlanty, Coulter-Kern & Duchane, 2007).

The nature of classroom interface and resulting classroom environment has a powerful influence on how well students achieve array of desired educational outcomes. The research literature has shown that students' outcomes such as achievement and attitude towards school subjects might be improved by creating classroom environment that is more approving to learning (Cort, 1979; Fraser, 1986; Goodlad, 1984). One can assume that having a positive classroom environment is educationally desirable in its own right. Comprehensive evidence presented by the research established that the nature of classroom environment has powerful influence on how well students attain a range of desired educational outcomes. The classroom environment has found to be directly related with academic achievement (Fraser, 1986).

Students experience both positive and negative emotions while learning mathematics, and these emotions influence the expansion of their attitude towards mathematics as a whole. Four affective issues often arise when learning mathematics: the role of the teacher; support and influence of the family; challenge and issues of fear of failure, and avoidance (Sliva & Roddick, 2001). All four of these issues have great prospective to influence a student's attitude towards mathematics. It follows therefore, that in order to have better students' performance in mathematics, there is need to stimulate them to have positive attitude towards the subject. Choudhury and Das (2012); He (2007), and Skouras (2014) have reported that adolescents' mathematics attitudes significantly predicted their mathematics achievement,

whereas the findings by Bala (2006) show that the contribution of mathematical attitude was negligible in predicting mathematics achievement. Obiedat (1992) examined mathematics achievement of grade XII students in relation to their gender, intelligence, mathematics thinking and socio economic status and found that there was no significant mean difference between male and female students in mathematics achievement and there was significant difference between high IQ and low IQ grade XII students in mathematics achievement, and difference between high mathematics thinking and low mathematics thinking grade XII students in mathematics achievement was significant.

REVIEW OF RELATED LITERATURE

Choudhury and Das (2012) examined influence of attitude towards mathematics and study habits on the achievement in mathematics at the secondary stage and found that attitude towards mathematics and study habits was directly related with achievement in mathematics. Analysis of data indicated that there was no significant difference in the achievement in mathematics of students in case of medium and sex. The regression equation thus obtained shows that attitude towards mathematics and study habits contribute 15.2%, and 29% respectively to the achievement in mathematics.

Vukovic, Roberts and Wright (2013) examined whether children's mathematics anxiety serves as an underlying pathway between parental involvement and children's mathematics achievement and reported that parents influence their children's mathematics achievement by reducing mathematics anxiety, particularly for more difficult kinds of mathematics. Mathematics anxiety did not mediate the relationship between home support and expectations and arithmetic.

Peters (2013) examined the relationships among classroom climate, self-efficacy, and achievement in undergraduate mathematics and reported that classroom climate was not a significant predictor of mathematics achievement and classroom climate did not moderate the relationship between mathematics self-efficacy and achievement, and no gender differences were not found with regard to mathematics achievement.

Skouras (2014) investigated factors associated with middle-school mathematics achievement in Greece. This study presents a subset of factors and their association with students' achievement

in school algebra. The participants were students who had enrolled in 2007 at the ninth year of Greek public education (third year of middle school). A written algebra test and a questionnaire including demographic survey items were used to collect data. The results shows that ATM and the current teacher rating of mathematics performance were identified as the more major predictors of algebra achievement, contributing by 18.1% and 24.7%, respectively, in total variance of mean at the end of ninth grade.

NEED OF THE STUDY

A close analysis of related literature clearly depicts that the studies on mathematics achievement and other variables i.e. parental involvement, classroom environment and attitude towards mathematics have been carried out separately and not taken collectively. This does not give a clear picture of relationship of mathematics achievement with these variables. To the best knowledge of researcher, no study of this nature has been conducted in India. Most of the studies reviewed here have been carried out abroad. There is a great scope of research work in India. Hence, dearth of research in mathematics achievement of ninth class adolescents in relation to parental involvement, classroom environment and attitude towards mathematics and the irregularity in the findings reported by various researchers as well as the great importance of mathematics inspired the investigator to take up the present study.

OBJECTIVES

The study was planned and designed to achieve the following objectives:

1. To find out the relationship of achievement in mathematics of ninth class adolescents with parental involvement, classroom environment and attitude towards mathematics.
2. To find out the predictors which will forecast the variance towards achievement in mathematics contributed by parental involvement, classroom environment and attitude towards mathematics of ninth class adolescents.

HYPOTHESES

Hypothesis 1(a) There exists significant positive relationship of achievement in mathematics with parental involvement of ninth class adolescents.

Hypothesis 1(b) There exists significant positive relationship of achievement in mathematics with classroom environment of ninth class adolescents.

Hypothesis 1(c) There exists significant positive relationship of achievement in mathematics with attitude towards mathematics of ninth class adolescents.

Hypothesis 2 Significant variance towards achievement in mathematics of ninth class adolescents is contributed by parental involvement, classroom environment and attitude towards mathematics.

DESIGN OF THE STUDY

In the present study, the descriptive exploratory research has been employed. According to Best and Kahn (1992), “Method of descriptive research is particularly appropriate in the behavioral sciences because many of the types of behavior that interest the researcher cannot be arranged in an artificial setting.” The present study was conducted to study achievement in mathematics of ninth class adolescents in relation to parental involvement, classroom environment and attitude towards mathematics.

In the present investigation, independent variables are parental involvement, classroom environment and attitude towards mathematics and the dependent variable is achievement in mathematics.

SAMPLE

INITIAL SAMPLE

The investigator conducted the survey in 20 schools of Chandigarh (10 government and 10 private). The initial sample consisted of 1000 ninth class students. Out of these, 500 students (250 males and 250 females) were taken from government and 500 students (250 males and 250 females) from private schools.

FINAL SAMPLE

Out of the initial sample of 1000 ninth class students, 75 entries were excluded from further analysis because of missing and incomplete responses. The final sample, hence, consisted of 925 ninth class students, out of which, 453 students were from government schools and 472 from private schools. Out of 453 government school adolescents, 223 were males and 230 were females. Further, out of 472 private school adolescents 241 were males and 231 were females.

RESULTS AND DISCUSSION

Hypothesis 1 states, “There exists significant positive relationship of achievement in mathematics with parental involvement, classroom environment and attitude towards mathematics of ninth class adolescents.” In order to test this hypothesis, Table 1 has been prepared.

Table 1: Correlation of Achievement in Mathematics with Different Dimensions of Parental Involvement, Classroom Environment and Attitude towards Mathematics of Ninth Class Adolescents (N=925)

Variables	Achievement in Mathematics
Parental involvement	0.410**
Classroom environment	0.275**
Attitude towards mathematics	0.266**

**** Significant at 0.01 level**

Entries made in Table 1 reveal significant and positive correlation between achievement in mathematics and parental involvement, classroom environment and attitude towards mathematics.

The positive and significant relationship between total parental involvement and mathematics achievement indicates that those adolescents whose parents are more involved in the activities of their children score high in mathematics. Hence, the higher the involvement of parents in the activities of their children, the higher is their achievement in mathematics. Further, the positive and significant correlation between total classroom environment and mathematics achievement indicates that the more favorable the classroom environment, the higher is mathematics achievement of adolescents. A positive and significant correlation between achievement in mathematics and total attitude towards mathematics indicates that attitude of adolescents towards mathematics affects their achievement in mathematics.

Hypothesis 2 states, “Significant variance towards achievement in mathematics of ninth class adolescents is contributed by parental involvement, classroom environment and attitude towards mathematics.” To test this hypothesis the values of multiple R and F- Ratios were calculated and entered in Table 2.

RESULTS

Table 2

R -Values and F -Ratios with regard to Achievement in Mathematics of Ninth Class Adolescents

(N= 925)

Variable	R	R ²	% Variance	F –Value	Step up Regression Equation
1.234	.451	.203	20.3	78.25**	Y= -16.548+0.269** x ₁ +0.201 **x ₂ +0 .069**x ₃
1.23	.436	.190	19.0	108.27**	Y= -12.635+ 0.298** x ₁ +0 .229 **x ₂
1.2	.410	.168	16.8	186.86**	Y= -5.803+ 0.341 ** x ₁

** Significant at 0.01 level

1. Achievement in Mathematics x₁ = Parental Involvement
2. Parental Involvement x₂ = Classroom Environment

3. Classroom Environment $x_3 =$ Attitude towards Mathematics
4. Attitude towards Mathematics $Y =$ Achievement in Mathematics

First of all, the effect of all the three independent variables i.e. parental involvement, classroom environment and attitude towards mathematics was seen on achievement in mathematics of ninth class adolescents. Table 2 shows that the values of multiple R and R^2 were 0.451 and .203 respectively. The analysis of variance for the multiple regression data yielded an F - value of 78.25 which was significant at 0.01 level.

Further, in the next trial, attitude towards mathematics with least t-value was removed from the model and the values of multiple R and R^2 were found to be 0.436 and 0.190 respectively. Again F- value was found to be 108.27, which was significant at 0.01 level. In the second trial the contribution of parental involvement and classroom environment was significant at .01level of significance.

In addition, classroom environment with the lowest t- value was deleted in the final trial. In the final run the values of the multiple R and R^2 were 0.410 and 0.168 respectively and F- value was found to be 186.86 which was significant. Here again the contribution of parental involvement was significant at .01level of significance.

DISCUSSION OF RESULTS

Entries made in Table 2 show that parental involvement, classroom environment and attitude towards mathematics contributed a significant variance towards achievement in mathematics of ninth class adolescents. 20.3% of the variance in achievement in mathematics among the ninth class adolescents was explained by a linear combination of parental involvement, classroom environment and attitude towards mathematics. 19.0% of the variance in achievement in mathematics was contributed by parental involvement and classroom environment taken together and 16.8% of the variance in achievement in mathematics was contributed by parental involvement only. The results indicate that parental involvement has the greatest contribution (16.8%) to the prediction followed by classroom environment (2.2%) and attitude towards mathematics contributed (1.3%) variance in mathematics achievement of ninth class adolescents.

The remaining 79.70% of variability towards achievement in mathematics remains unexplained. This suggests that there are some other variables than parental involvement, classroom environment and attitude towards mathematics which may be highly related to achievement in mathematics of ninth class adolescents.

Thus, the Hypothesis 2, namely, “Significant variance towards achievement in mathematics of ninth class adolescents is contributed by parental involvement, classroom environment and attitude towards mathematics” has been accepted. The findings are in agreement with the findings of Olatoye and Agbatogu (2009) who have reported that parental involvement accounts for 16.1% of the total variance in mathematics achievement of primary school pupils. These findings are also in line with findings by Bennett (2001) who has reported that all five classroom climate indicators combined together explain only 10.5% of the variance in mathematics achievement. The present results are supported by Choudhury and Das (2012); He (2007) and Skouras (2014) who have reported that adolescents' mathematics attitudes significantly predicted their mathematics achievement. However, the present findings contradict the findings by Bala (2006) who has reported the contribution of mathematical attitude as negligible in predicting mathematics achievement.

FINDINGS

CORRELATION ANALYSIS

Relationship of achievement in mathematics with parental involvement, classroom environment and attitude towards mathematics of ninth class adolescents

- There is a significant and positive correlation between achievement in mathematics of ninth class adolescents and different dimensions of parental involvement i.e. general welfare, monitoring, psychological autonomy, leisure time activities, academic growth, and total parental involvement.
- Achievement in mathematics of ninth class adolescents has a positive and significant relationship with various dimensions of classroom environment i.e. involvement,

affiliation, teacher support, task orientation, competition, order and organization, rule clarity, teacher control, innovation, and total classroom environment.

- Achievement in mathematics of ninth class adolescents has a positive and significant relationship with various dimensions of attitude towards mathematics i.e. self-confidence, motivation, usefulness, teacher's expectations, enjoyment, and total attitude towards mathematics.

REGRESSION ANALYSIS

- The variance towards achievement in mathematics contributed by parental involvement, classroom environment and attitude towards mathematics of ninth class adolescents
- Results show that parental involvement, classroom environment and attitude towards mathematics contributed a significant variance towards achievement in mathematics of ninth class adolescents. Parental involvement has the maximum contribution (16.8%) to the prediction followed by classroom environment (2.2%) and then attitude towards mathematics (1.3%) to achievement in mathematics of ninth class adolescents. 20.3% of the variance in the achievement in mathematics among the ninth class adolescents was explained by predictor variables i.e. parental involvement, classroom environment and attitude towards mathematics.

CONCLUSIONS AND EDUCATIONAL IMPLICATIONS

- As Mathematics is the pillar of almost all the streams of education and plays a major role in almost all the careers, it is not only beneficial but essential to establish factors that determine achievement in mathematics of adolescents.
- The results of the present study suggest that parental involvement has a direct bearing on mathematics achievement of adolescents. Parents should therefore devise means by which they would be involved in the academic activities of their children also adolescents can be afforded the opportunities for independence, yet experience parent involvement strategies that help to raise their mathematics achievement. It is also very essential to guide parents how to structure their child's time to a greater degree and involve more in mathematics-

related activities of the adolescents. The schools should also organize orientation and training programmes for parents as to how they can be involved with their children's studies.

- The results of the study also support the significant role played by classroom environment in the mathematics achievement of adolescents. It is recommended that the teacher should form more cohesive environment in the classroom and encourage creative thinking and healthy competition among adolescents. Teacher should develop constructive relationship with students and stress classroom activities that involve active teaching- learning process and students' participation in the class.
- Attitude towards mathematics was found to be an important predictor in this study. Efforts should be made to develop and gauge the positive attitude towards mathematics. Therefore teachers should arrange such activities in the classroom which may make the adolescents self confident in handling mathematical problems and motivate them for learning mathematics. Stakeholders should organize periodic seminars and workshops for students, parents and teachers designed to encourage positive attitudes towards mathematics. These programs should begin at the primary level and continue throughout the school career, producing positive results in the long run.

LIMITATIONS

The present study has following limitations:

1. Sample of 925 adolescents studying in Government and Private Schools of U.T. Chandigarh.
2. Students of ninth class only.
3. Four variables i.e. achievement in mathematics, parental involvement, classroom environment and attitude towards mathematics only.

SCOPE FOR FURTHER RESEARCH WORK

It is clear that adolescents' mathematics achievement has been influenced by a wide variety of factors. This study has gone some way in identifying a few of these factors, but there is still plenty of scope for future research:

Due to the paucity of time, the present study was restricted to find the relationship of achievement in mathematics with parental involvement, classroom environment, and attitude towards mathematics. Similar studies can be conducted by taking other factors such as the motivation of students, peer influence, the impact of teaching methods, impact of adolescents' parents' and peers' beliefs about learning mathematics. This study included the sample from urban area i.e. ninth class adolescents of Chandigarh only. Further research work could be undertaken to replicate the present study in rural areas also.

REFERENCES

- Aminu, J. (1990). Address by the Honourable Minister of Education, Federal Ministry of Education, Nigeria. *Abacus*, 20 (1), 22- 29.
- Anderson, K. J., & Minke, K. M. (2007). Parent involvement in education: Toward an understanding of parents' decision making. *Journal of Educational Research*, 100 (5), 311.
- Bala, R. (2006). *Teacher parental support, study habits, aptitude for and towards mathematics as predictors of mathematics achievement* (Unpublished doctoral thesis). Panjab University, Chandigarh.
- Best, J. W., & Kahn, J. V. (1992). *Research in education* (8th ed.). New Delhi: Prentice Hall of India Private Limited.
- Bennett, J. (2001). *The relationship between classroom climate and student achievement* (Doctoral dissertation). Retrieved February 16, 2014 from www.library.unt.edu/.
- Catsambis, S. (2001). Expanding knowledge of parental involvement in children's secondary education: Connections with high school seniors' academic success. *Social Psychology of Education*, 5(2), 149-177. Retrieved from <http://link.springer.com/article/10.1023%2FA%3A1014478001512>.
- Chen, W., & Gregory, A. (2009). Parental involvement as a protective factor during the transition to high school. *Journal of Educational Research*, 103(1), 53.
- Choudhury, R., & Das, D. K. (2012). Influence of attitude towards mathematics and study habits on the achievement in mathematics at the secondary stage. *International Journal of*

- Engineering Research and Applications (IJERA)*, 2(6), 192-196. Retrieved December 22, 2013 from www.ijera.com.
- Cort, H. R. (1979). A social studies evaluation. In H. J. Walberg (Ed.), *Educational environments and effects: Evaluation, policy and productivity*. Berkeley, CA: McCutchan, 235-57.
- DePlanty, J., Coulter-Kern, R. & Duchane, K. A. (2007). Perceptions of parent involvement in academic achievement. *Journal of Educational Research*, 100 (6), 361.
- Epstein, J. L., & Sheldon, S. B. (2002). Present and accounted for: Improving student attendance through family and community involvement. *The Journal of Educational Research*, 5, 308. doi:10.2307/27542393.
- Fraser, B. J. (1986). *Classroom psychology*. London: Croom Helm.
- Goodlad, J. A. (1984). *A place called school: Prospects for future*. New York: Mc Graw Hill.
- Hawes, C. A., & Plourde, L. A. (2005). Parental involvement and its influence on the reading achievement of 6th grade students. *Reading Improvement*, 42(1), 47-57.
- He, H. (2007). *Adolescents' perception of parental and peer mathematics anxiety and attitude toward mathematics: A comparative study of European-American and mainland-Chinese students*(Doctoral dissertation). Available from ProQuest Dissertations and Theses Database. (UMI No. 3264402)
- Moos, R. H., & Trickett, E. J. (1987). *Classroom Environment Scale Manual*. Palo Alto: CA: Consulting Psychologist Press.
- Obiedat, A. A. S. (1992). A study of mathematics achievement of grade XII students on GSCE in Irbid, Jordan in relation to their gender, intelligence, mathematical thinking and socio-economic status. *Fifth Survey of Educational Research, Vol. II*. New Delhi: N.C.E.R.T.
- Olatoye, R. A., & Agbatogun, A.O. (2009). Parental involvement as a correlate of pupils achievements in mathematics and science in Ogun state Nigeria. *Educational Research and Review*, 4 (10), 457-464. Retrieved from <http://www.springerlink.com>.
- Peters, M. L. (2013). Examining the relationships among classroom climate, self-efficacy, and achievement in undergraduate mathematics: A multi-level analysis. *International*

Journal of Science and Mathematics Education, *11*(2), 459-480. Retrieved from <http://link.springer.com/article/10.1007%2Fs10763-012-9347-y>.

Sharma, J. N. (2007). *Research methodology: The discipline and its dimension*. New Delhi: Deep and Deep Publications.

Skouras, A. S. (2014). Factors associated with middle-school mathematics achievement in Greece: The case of Algebra. *International Journal of Mathematical Education in Science and Technology*, *45* (1), 12-34. doi : 10.1080/0020739X.2013.790500.

Sliva, J. A., & Roddick, C. (2001). Mathematics autobiographies: A window into beliefs, values and past mathematics experience of pre-service teachers. *Academic Education Quarterly*, *5*(2), 101-107.

Vukovic, R. K. , Roberts, S. O., & Wright, L.G. (2013). From parental involvement to children's mathematical performance: The role of mathematics anxiety. *Early Education and Development*, *24*, 446–467. Retrieved from <https://steinhardt.nyu.edu/.../vukovic%20et%20al%202013%20EED.pdf> .