



Influence of Gender, Parental Education and Parental Occupation on Mathematics Achievement of Secondary School Students

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ABSTRACT

This study examined the influence of gender, parental education, and parental occupation on mathematics achievement. The population of this study consists of 793 males and 334 females from 14 secondary schools of Central Uttar Pradesh (India). The Mathematics Achievement Test and A Personal and Familial Background assessment Questionnaire were used for data collection, while t-test used for statistical analysis. The results of the analysis showed that the male students as well as female students were equally good in mathematics achievement. In this study parental education is found to be an important factor of children achievement in math. Children from highly educated parents are likely to have significantly higher math achievement scores as compared to the children of less educated parents. It has been found that father's occupation is related to their children achievement in math. The nature of father's occupation is important for their children's math achievement. Children of professional group have got highest math scores than all other groups. Children of businessman group have got more math achievement than other two groups but less than the professional group. The children of others groups have got more achievement than the children of agriculturist group and on the other hand children of agriculturist group have got lowest math achievement scores. It has been also found that mother's occupation was not related to academic achievement in math. Children of housewife and working mothers have been found equally good or bad in math achievement.

KEYWORDS

Mathematics Achievement, Gender, Parental Education and Parental Occupation

Introduction:

Education is the key to all processes of development especially-human development. Catalytic action of education in this complex and dynamic growth process needs to be planned meticulously and executed with great sensibility.

Education is fundamental to all round development of human Potential material and spiritual. It refines sensibility and perceptions that contribute to national cohesion, a scientific temperament and independence of mind and spirit. Thus furthering goal of socialism, secularism and democracy enshrined in our constitution. Education develops manpower for different levels of economy and empower the poor masses to become self-reliant enough to participate in the process of national development. Education is thus an instrument for developing an economically prosperous society and for ensuring equity and social justice through enriching the knowledge.

Mathematics has played a decisive role in building up our civilization. But in doing so, it has also made itself essential for the existence and progress of modern world. In modern world we have to be more and more exact, we make larger use of quantitative terms. We have to be accurate to a split of second. All this requires large calculations and minute mathematical understanding.

Mathematical thinking is important for all members of a modern society as a habit of mind for its use in the work place, business and finance; and for personal decisions making. Mathematics is fundamental to national prosperity in providing tools for understanding science, engineering technology and economics. It is essential in public decision making and for participation in the knowledge economy.

Math is an important component of school education in the modern world. It is used in almost every phases of human life. A strong background in math is crucial for many career &

job opportunities in today's increasingly technological society. There can be no true schooling without math. In the present social set-up, mathematics is more important for the common man. In this age of taxes, insurance premium savings and interests, rents and propaganda a person only with good mathematical background can be reasonably sure that he is getting his due.

A well grounded understanding of math is an essential for everyday life as for higher study in the fields of science & technology. Math holds a unique place in every society today. People accept the fact that math is vital to the continued growth of the nation, both for expanding internal advancement and maintenance of leading role in the world community. Math aids man in his understanding of the world, he lives and in turn, modifies the worlds and his needs as he continues to develop. It has played a decisive role in building civilization of a nation.

Achievement is the end product of all educational endeavors. The main concern of all education efforts is to see that the learner achieves. Quality control, quality assurance and total quality management of achievement have increasingly gained the attention of research in education. After exploring the concept of achievement in the cognitive, affective and psychomotor aspects of human behavior, researchers have probed further and have attempted to understand the 'blackbox' of achievement.

Academic achievement is a paramount importance particularly in the present social, economic and cultural context. Obviously, in the school great emphasis is placed on achievement right from the beginning of formal education. The school has its own systematic hierarchy which is largely based on achievement and performance rather than quality. Thus, the school tends to emphasized achievement which facilitates among other things, the process of role allocation for the social system.

Conceptual Frame Work

Reviewing research prior to the 1970's, Maccoby and Jack-

lin (1974) concluded that gender difference favoring boys in mathematics ability and girls in verbal ability were well established. By comparison, gender differences in achievement, especially mathematics, have not been consistent and continue to be a much debated topic (Leder, 1992). In an examination of 98 mathematics achievement studies, Frideman (1989) noted that until age 10 either no differences between genders or differences favoring girls are observed (e.g. Callahan & Clements, 1984; Dossey et al., 1988; Hawn, Elliot, & Des Jardines 1981). For the middle school years, some research favored girls (Tsai & Walberg, 1983), and some favored boys (Hilton & Berglund, 1974); other research showed no difference (Circicelli, 1967; Fennema & Sherman, 1978). In her meta-analysis, Feridman (1989) observed that in five of seven studies 12th-grade boys outperformed 12th-grade girls, with the remaining two studies showing no difference. Finally, with regards to standardized tests, boys tend to score higher than do girls (Halpern & LaMay, 2000); the difference is more prevalent in the extremes of ability distribution (Willingham & Cole, 1997). The research has consistently shown that at the end of high school boys perform better than girls on mathematics achievement tests whereas girls typically perform as well as boys in elementary school and perhaps, in middle school (Ewers & Wood, 1992; Marsh, 1989; Skaalvik 1990). Also, there is some evidence that girls achieve better than boys on verbal tests (Halpern, 1992; Reuterberg, Emanuelsson & Svensson, 1993).

The increasing gender differences in math achievement in the high school years are most frequently explained in terms of sex stereotypes and differential sex role socialization patterns (e.g. Eccles, 1987; Fennema & Peterson, 1985; Meece, Parsons, Kaczala, Goff & Futterman 1982). When it is sex typed math is viewed as a male domain (Eccles, Adler, Futterman, Goff, Kaczala, Meece & Midgley, 1983; Fennema & Sherman, 1978). Where as reading and language are stereotyped as female domains (Kaczala, 1981 Stein & Smithells, 1969). Sex stereotypes also suggest that boys have better math abilities than girls and that math is more important for boys (Jacobs & Eccles 1985). According to Jacobs & Eccles sex stereotypes also suggest that girls have better verbal abilities than boys.

Dave & Dave (1971) investigated the relationship of parental education on caste with the academic achievement. they found that higher percentages of rank holder belong to homes with higher parental education where as a higher percentages of failed students belong to those who have lower parental education. Bridge et al (1979) concluded that the achievement level of a student in math is directly proportional to the level of his parent's education. Glasman and Biniaminov (1981) concluded that the achievement level of a student in math is directly proportional to the level of his parents education. There is more direct evidence of a relationship between SES and mathematics skills, although the relationship itself may actually be somewhat weaker. In a meta-analysis of the effects of SES on various kinds of cognitive test scores, white (1982) found that the average two way correlation (out of a sample of 128) between SES and mathematics scores was. The most commonly used measures of SES in white (1982) Sample were family income, father's educational level, mother's educational level, and father's occupational status or type. Multivariate analyses that have used two or more of these indices have found that each one has sizable independent effects on mathematics scores. (Coleman et al, 1966, Hauser, 1971; Hess, Holloway, Dickson, and price, White 1982).

Parental occupation may influence student's performance in various ways. For Example, occupation related income may determine access to learning opportunities and resources and so play role in learning outcomes. Parental occupation may also influence how students perceive the value of math learning, their beliefs about the usefulness of math and learning environment at home (Education Matter, 2004). Ojha (1979) found for both rural and urban students parental occupation and income were related to their educational achievement. Quadh (1996) found statistically significant negative relationship between students' GPA and their father's and mother's income and occupation. Verghese (1994), Singh and Saxena

(1995) they found that parental occupation is an important factor associated with learner achievement in math.

Every research study deals with the solution of some problems of human interest. That is why the researcher has a definite purpose he has certain specific aims and goals to achieve through his research work. The present study was aimed at achieving the following objectives.

- To compare the mathematics achievement of secondary school students on gender basis.
- To study the influence of parental education on math achievement of students.
- To study the impact of parental occupation on math achievement of students.

Method: The current work is a descriptive study investigating if students' mathematics achievement differed significantly to a group of variables such as gender, parental education and parental occupation. The sample consisted of 1127 secondary school students, selected from 14 schools of central U.P., of India, in which 793 (70.36%) were male and 334 (34.96%) were female students. In this study, schools are categorized on the basis of their management. For instance, CBSE schools are prestigious English medium co-education schools managed by private management having high reputations in society. That is the reason that pupils in these schools belong to well-to-do families with high socio-economic status (SES). KVS Schools fully controlled financed supported and administered by central government are English Medium coeducational schools, where pupils in IX and X are from all socio-economic strata and are admitted through all India based competitions. Generally Government and Government Aided schools are Hindi medium single sex schools run by Government directly or indirectly through aids, and are widely known among general public for their poor management by Government machineries. The schools run by minority trusts through minority managements are termed as minority managed schools respectively. These schools can be seen as somewhere in between Christian missionaries and Muslim minority schools on one hand and Government and Government Aided schools on other hand.

Tools Used: **Mathematics Achievement Test**

The achievement test in mathematics for class IX students that is used in the present study was constructed by the investigator. This is a very comprehensive test based on 14 chapters of class VIII math text book (NCERT). The test consists of 60 items of multiple choice type representing achievement at various areas of math such as 21 items in arithmetic, 19 items in algebra and 06 items in geometry, 11 items in mensuration and 4 item in statistics. The total score on the test as a whole was used as a measure of achievement in math. All the items in the test were the easy items in the test were arranged in order of difficulty, the easy items being placed in the beginning and this was done to motivate the students. The difficulty values of items in the test between the range of .25 to .85 similarly, each item had a discriminating power greater than 0.30. The test was based on the latest syllabus prescribed by the directorate of education, U.P. & NCERT. This test had a fairly high content validity and its reliability is found to be 0.94.

A Personal and Familial Background Assessment Questionnaire

The personal information sheet was prepared by the investigator. This sheet contains such questions requiring the subjects to give information on their parental educational and occupational background as well as on some economic facilities available at home, family size, parental involvement in tutoring their children, students' involvement in extracurricular activities and time spent on watching T.V. etc.

Results and Analysis :

Data analysis is performed on computer with SPSS 14 software package. When data was analyzed to make a comparative study of the achievement in mathematics of male and

female students (Table 1) the result shows a significant difference between achievement in mathematics of males and females (df=1125, t=0.26).

A:Gender And Math Achievement:
Table 1: Comparison of mean math achievement scores of male and female students

Gender	N	Mean score	SD	T	Df	Sig./Not sig.
Male	793	20.24	8.94	0.26	1125	Not
Female	334	20.42	10.70			

Table 2: Comparison of mean achievement scores in math on the basis of their father's education

Group	Father's education	N	Mean ach. score	SD	t-value		
					A	B	C
A	Illiterate	118	16.04	6.99	x		
B	Up to class 12	667	17.55	7.99	2.11**	X	
C	Degree level and above	342	27.11	9.40	13.49*	16.05*	x

**Sig. at p<0.05 level and *Sig. at p<0.01 levels

For studying relationship between fathers education and their children's achievement in math the data was categorized into three groups, i.e., illiterate, having received education up to class 12th, and degree levels & above, on the basis of their fathers education. The mean math scores of their children of these groups are 16.04, 17.55 and 27.11 respectively. The scores of these groups were put to analysis of variance. Analysis of variance of the mean scores of the three groups gives F value as 8.86, which is significant at 0.01 level, with df 2, 1124. This implied that there is significant overall difference in the means of these three groups. Hence t-test was applied for further investigation. The mean achievement scores of children of illiterate fathers is 16.04, SD=6.99 and in case of children of up to class 12th fathers education the mean achievement scores is 17.55, SD=7.99 and in case of children of degree level and above fathers education is 27.11, SD=9.40. The calculated t-values are 0.26, 13.49 & 16.05 respectively, which are significant at 0.05 and 0.01 levels of confidence with 783, 458, 1007 df respectively.

Table 3: Comparison of mean achievement scores in math on the basis of their mother's education

Group	Mothers education	N	Mean ach. score	SD	t-value		
					A	B	C
A	Illiterate	237	15.87	7.43	x		
B	Up to class 12	664	19.55	8.83	6.21*	x	
C	Degree level and above	226	27.12	9.72	13.94*	10.34*	x

*All t-value Sig. at p<0.01 level

For studying the relationship between mother's education and their children's achievement in math, three groups of mothers i.e. illiterate, up to class 12th, degree level & above were formed on the basis of their education. The math achievement scores of children's of these groups of mothers are 15.87, 19.55 and 27.12 respectively. The scores of these groups were put to analysis of variance and t test. Analysis of variance of the scores of the three groups yielded significant F value as 101.60 which is significant at 0.01 level in the df=2, 1124. This implied that there is significant overall difference in the means of these groups. When t-test was applied to compare each mean with every other mean, significant difference was obtained in all the three groups and all t values are found significant at 0.01 level of confidence with df 899, 461 and 888 respectively. From the trend it is quite clear that as the mother's education increases the achievement in math of their children also increases accordingly.

The total numbers of male and female students were 793 & 334 respectively as indicated by the table 1. Out of 60 scores, the mean achievement scores in math of male student is 20.24 and SD=8.94. In case of female students, the mean math achievement score is 20.42 and SD=10.70. The statistically calculated t-value is 0.26 which is not significant at 0.05 level with 1125 df. The result clearly indicates that there is no significant difference between mean math achievement score of male and female secondary school students. Both are equally good.

B:Parental Education And Math Achievement:

C:Parental Occupation And Math Achievement:
Table 4: Comparison of mean achievement scores in math on the basis of their father's occupation

Group	Fathers occupation	N	Mean ach. score	SD	t-value			
					A	B	C	D
A	Professional	112	25.72	10.21	x			
B	Businessman	273	23.14	10.18	2.25**	x		
C	Agriculturist	281	16.95	6.71	8.40*	6.98*	x	
D	Others	461	19.33	9.33	6.03*	5.01*	3.21*	x

**Sig. at p<0.05level and *Sig. at p<0.01 levels

At a glance at the table 4 denotes that the mean achievement scores of children of professional, businessman, agriculturist and others fathers were 25.72, 23.14, 16.95 and 19.33 respectively. t-test was applied to compare each mean with every other mean, significant difference were obtained between all the means. All the sixths were found significant at 0.05 and 0.01 levels. The df of these six groups were 383, 391, 571, 554, 734 & 742 respectively. From the trend it is quite clear that children's of professional groups have highest score in math than other three groups and on the other hand children of low occupational status. (Agriculturist) have lowest scores in math than other three groups. Children of businessman have more achievement in math than the children of others and agriculturist and less achievement than the professional groups. Children of others group have less achievement than professional and businessman and more than agriculturist groups. The tendency that becomes clear from the study that father's occupation effects the achievement of their children's in math.

Table 5: Comparison of mean achievement scores in math between children of housewife and working mothers

Mothers occupation	N	Mean achievement score	SD	t	df	Sig. level
House wives	1052	20.28	9.29	.20	1025	Not
Working	75	20.56	11.98			

For studying relationship of mothers occupation and achievement in math of their children's, mothers were categorized into two groups i.e. housewife and working mothers. It is clear from table 5 that the numbers of children of housewife and working mothers were 1052 and 75 respectively. The mean achievement score of children's of housewife mothers was 20.28, SD=9.29. In case of children's of working mothers, the mean achievement score was 20.56, SD=11.98. The calculated t-value was 0.20 which was not found to be significant at 0.05 level with 1025 df.

Discussion:
The purpose of the present research was to determine the effects of gender, parental education and parental occupation on achievement in math. These two variables were chosen for analysis because they are manipulable variables that have been identified as important influences on achievement in previous research. Data from a large contemporary sample of high schools students were analyzed. t-test were used to determine the effects of these variables on academic achievement, while controlling for other relevant background influences.

The results of the analysis of data shows that the, parental education and father's occupation, had significant effect on math achievement scores excepted gender and working mothers.

There were no significant differences in math achievement scores between boys and girls in the present study. The finding of this study is supported by Branholt, Goodraw & Conney (1999), Ewers & Wood 1992; Skaalvik, 1990; Hilton & Berglund (1974). Awartani and Gray (1989) reported no significant differences between male and female students in math achievement. Ma (1995) studied a sample of high school seniors, based on algebra and geometry achievement. He found no gender differences in algebra but males significantly outperformed females in geometry. Gender differences in achievement, especially math, have not been consistent and continue to be a much debated topic (Leder, 1992). Gender differences and the findings on gender differences in math achievement are not newly emerged fact. Long research history in this area has demonstrated that male advantage in math achievement is a universal phenomenon (Beaton et al, 1996; Mullis et al., 2000). Researchers have shown that boys tend to score higher than girls on problems that include spatial representation, measurement, proportions as well as complex problems; whereas girls tend to score higher on computations, simple problems and graph reading (Beaton et al. 1999) According to some research findings, the gender gap in math achievement increases during middle school and becomes more disturbing at the upper secondary level (Fennema et al. 1998; Fennema, 1985).

In this study parental education is found to be an important factor of children's achievement in math. Children from highly educated parents are likely to have significantly higher math achievement scores as compared to the children of less educated parents. This study is supported by Mehra, 1980; Shukla, 1994, and Kadriye, Tanya & Vanessa (2005). The path model for both sexes showed that educated mothers had strong indirect effects on their children's math achievement (Campbell & Beauetruy 1998). Schools that had more resources, had higher average parent education on average had higher mean advanced math achievement (Schreiber, 2002 and Schreiber, 2002). Wilkins & Ma (2002) found that parent education and home resources had a positive relationship with students initial status in all three content areas (Statistics, algebra & geometry). Latest results from the Programme for International Student Assessment (2004) for student achievement in mathematics. PISA 2004 found that there is a positive relationship

between the educational level of the parents and student performance in mathematics, there is also considerable overlap in the performance of students from different educational background. Hence family background was also related to student performance in math. Students whose parents were university educated performed higher than those whose parents had no more than a high school education.

It has been found that father's occupation was related to academic achievement in math. The nature of father's occupation is important for their children's math achievement. Children of professional groups (Engineer, doctor, businessman, administrator, educationists etc.) fathers have got highest math score than all the professional groups. Children of business man groups' fathers have got more math achievement than other two groups but less than the children of professional groups. The children of others group (Peon, Cooli, daily wagers etc.) have got more achievement than the children of agriculturist. The result shows clearly children of professional groups of fathers have got highest achievement and on the other hand children of agriculturist have got lowest achievement in math. This study suggests that the adult education programs if focused on young mothers and fathers could be one approach to improve the students' achievement in math.

It has been found that mother's occupation was not related to academic achievement in math. Children of housewife and working mothers have been found equally good achievement in math. Although, this variable has been shown important variable in other studies (Bank & Finlayston, 1973) For example, Miline, Ginsburg, Myers and Rosenthal (1986) consistently found that mother's employment has a negative effect on both reading and mathematics achievement. In this regards Heyns and Catsambis (1986) pointed out that the effects of mothers' employment are highly related to socioeconomic status of the families. In other words, they stated that by omitting students from lower socioeconomic background from the sample; also omit the positive effect of mother's employment on academic achievement.

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