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Influence of Gender and Familial Factor's on Mathematics Achievement of Secondary School Students

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Abstract

This study examined the influence of gender, Familial Factor's (Parental Assistance and Family Size) 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. The results revealed that parental assistance is related to performance of their children in math. The results also explained the relationship between student's achievement and their family size. Children of smaller family size have got significantly higher achievement in math than the children of larger family size.

Key Words: Mathematics Achievement, Gender, Parental Assistance and Family Size.

Introduction: Education is universally recognized as the most effective tool of bringing desirable change towards the social and economic betterment & cultural transformation of a society in the status of human being and the country as a whole. It broadens the mental horizon of the human being. In one hand, education develops the total personality of the individual and on the other hand education contributes to the growth and development of society. It is only through education that the moral ideas, spiritual values, the aspiration of the nation and its cultural heritage are transformed from one generation to another for preservation, purification and sublimation into higher culture. Humphrys, Traxler and North (1960) have very correctly remarked "our future material and cultural welfare and progress, even our survival as a nation depends upon the wise use of abilities and energies of our people."

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.

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. One of the aim of teaching mathematics in schools is to inculcate the skills of quantification of experiences around the learners. Towards this, carrying out experiments with numbers and forms of geometry, framing hypotheses, verifying these with further observations from inherent part of mathematics learning.

Achievement in math is the stage of attainment in math by the students, generally expressed in terms of grade or scores. It is defined as performance of students in math tests based on scores. Achievement test is used to measure the degree of mastery of skills, fundamental concepts, process, general knowledge of subject. All educational tests are actually are generally achievement test used for certain purposes. According to Tenaja (1989), achievement refers to performance in a particular subject or in the whole curricular that is measured by school examination or test. In this study, achievement in math has been studied as knowledge, skill, comprehension & application attained in the math.

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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.

Conceptual Frame Work: Reviewing research prior to the 1970's, Maccoby and Jacklin (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 out performed 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 (Halperen & 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.

Number of family members has been found to be important predictor of of academic achievement. Family structure (parents and number of siblings) is also set to influence student's academic achievement (Manning, 1998, Ponj, 1997, 1998). Smaller family size has been linked with higher academic achievement (Eaman, 2005, Marjoribanks, 1996). Students with fewer siblings are likely to receive more parental attention and more access to resources than children from larger families.

Parental involvement has long been believed to be associated with a range of enhanced school outcomes for elementary, middle, and high school students, including varied indicators of achievement and the development of student attributes that support achievement, such as self-efficacy for learning, perceptions of personal control over school outcomes, and self-regulatory skills and knowledge (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996; Brody, Flor, & Gibson, 1999; Epstein & Van Voorhis, 2001, Fan & Chen, 2001; Frome & Eccles, 1998; Grolnick, Kurowski, Dunlap, & Hevey, 2000; Grolnick & Slowiaczek, 1994; Henderson & Mapp, 2002; Hill & Craft, 2003; Jaynes, 2003; Xu & Corno. 2003). Although parental involvement is an important contributor to children's positive school outcomes, much less is known about the factors that motivate parents' involvement practices.

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.

1. To compare the mathematics achievement of secondary school students on gender basis.
2. To study the influence of parental assistance and math achievement of students.
3. To study the relationship between size of the family and math achievement of children.

Method: The current work is a descriptive study investigating if students' mathematics achievement differed significantly to a group of variables such as gender, Parental Assistance and Family Size. 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 menstruation 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			

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: Family Size And Math Achievement

Table 2: Comparison of math achievement of students according to their family size

Family size	N	Mean achievement score	SD	T	df	Sig. level
Small	210	23.40	10.41	5.32	1125	Sig at .01 level
Large	917	19.58	9.13			

The total sample has been divided into two groups on the basis of their family size i.e. small family (4 members) large size more than 4 members). The number of students belongs to small size and large size was 210 & 917 respectively as indicated by this table 5.17. The mean achievement of students of small family is 23.40 and SD=10.41. In case of large family, the mean achievement score of the students is 19.58 ad SD=9.13. The statistically calculated t is 5.32 which is significant at 0.01 level with 1125 df. The result clearly indicates that math achievement of students of small size of family have greater achievement than the students of large family size.

C: Parental Assistance And Math Achievement

Table 3: Comparison of math achievement of children according to their parental assistance

Group	Parental involvement	N	Mean ach. score	SD	t-value		
					A	B	C
A	Never	176	17.58	7.87	x		
B	Some times	640	20.95	9.81	4.76*	x	
C	Always	311	20.48	9.43	3.63*	0.71	x

*Sig. at p<0.01 level

Data was categorized into three groups on the basis of parental assistance in problem solving at home of their children's, viz. never, sometime and always. Analysis of variance was applied for studying relationship between math achievement of children and their parental assistance. The mean math achievement of children who have never get any assistance, sometimes and always assistance in problem solving by their parents were 17.58, 20.95 and 20.48 respectively, when these means were examined by the analysis of variance. The calculated value of F is 8.92, which is significant at 0.01 with df 2, 1124. The numbers of children whose fathers never assist, sometimes assist and always assist in problem solving of their children were 176, 640 and 311 respectively. The mean and SD of these groups were 17.58, 7.87, 20.95, 9.81 and 20.48, 9.43 respectively. When t-test was applied to compare each mean with every other means math achievement score, significant difference was found between the mean of never and sometimes assistance (t=4.76, P<0.01) df=814) between the mean of never and always assistance (t=3.63 P<0.05, df=485).

Discussion: The purpose of the present research was to determine the effects of gender, parental assistance and family size 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 personal factors indices, parental assistance and family size had significant effect on math achievement scores except gender. 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 and the findings on gender differences in math achievement are not newly emerged fact. 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).

This study also explored the relationships between students' achievement in math and their size of the family. Children of smaller family have got significantly higher achievement in math than the children of larger family, i.e. there is positive correlation between size of the family and achievement in math. For example, Zajonc (1976) has indicated that increased externality was associated with larger family size. Also, it has been reported that the number of children's in the family had a significant negative effect on academic achievement (Iverson & Walberg, 1982; Hauser & Sewell, 1985). In all subjects, the scores of children's living with single parents did not differ significantly from those of children's living with two parents. Moreover, students living with no parents had lower reading and science scores than other students and this effect was mediated by lower family investment and involvement (Chiu & Ho, 2006). Small families typically have higher socioeconomic status, invest more in educational resources, spend more time with their children have larger social networks for their children's to top on than larger families. The small families give their children's more learning opportunities, exerted more presence, were more supportive, gave more help, provided more resources and hence raise their likelihood of higher academic achievement.

The prevailing perception among educational researchers is that successful schools establish practices that foster greater communication with parents, encourage parents to assist children's at home with their school work and planning and recruit parents to work as volunteers or participate in school governance. The argument is that these practices, in turn, lead to higher levels of schooling outcomes. the study of parental assistance in solving mathematics problems at home of their children and their achievement in math revealed that parental assistance is related to the performance of their child in math, calls for parent involvement in schooling are not new. In the 1970's researchers such as Sarson (1971), Lightfoot (1978) and others suggested that parents should play a greater role in school governance because both they and their children are influenced by school decisions. Milne, Myers, Rosenthal and Gesisburg (1986), focused on issues such as the degree to which parents help with homework and the relationship between parent behaviors' and student achievement. Astone and McLanahan (1991) suggested a positive association between parent involvement and student achievement. However, after analyzing data from the longitudinal study of American youth, Madigan (1994) developed ten indicators of parent involvement and found that parent help with homework and the provision of rewards for good grades sometimes had a negative effect on student achievement. Sui-Chu and Williams (1996) found that of the four types of parent involvement they identified, student parent discussion in the home was the most powerful predictor of student academic achievement. Milne et al (1986) found negative effects of parents helping their children with homework and suggested that this finding was attributable to the fact that

parents helped more if their children were not doing well at school. Muller (1993) too, reported negative effects for parents monitoring their eighth graders homework or providing more after school supervision and significant negative effects for parent's frequent contacts with school. The parental environment construct used by Fehrmann et.al (1987), which consists of monitoring and supervision, was also positively related to children's academic achievement. Further, the only type of parent involvement which was positively related to achievement was the home based type of parent involvement. For example the Coleman report (Coleman et al, 1966) as well as Mosteller and Moynihan (1972) and Coleman (1975) reported that home based variables were at least as important as the school based variables in accounting for the total amount of student achievement variance. Researchers are underway to explain the mechanism, how parental support has facilitating impact on academic success of the children, Parental support helps children to have a clear feedback about their progress. Consistent assistance benefits children's to set and meet academic goals. However the type of parental support provided to the children's should be appropriate to their age and grade levels.

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