Effect of Gender, internet browsing, sports activities and medium of instructions on mathematics achievement of class IX students of South-East Bihar (India)

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Abstract:

This study examined the effects of gender; time spent on internet browsing, participation in sports activities and medium of instructions on mathematics achievement of class IX students of South-East Bihar. The study consists of 975 male and 969 female students of thirty-six schools of South-East Bihar. The mathematics achievement test and personal background assessment questionnaire were used for data collection. While t-test, F-test followed by Duncan's Mean test were used for statistical analysis. The result showed that male students had better achievement in mathematics than female students. Further the result showed that participation in sports activities enhances the performance in mathematics and English medium students had higher mathematics achievement in comparison to Hindi medium students.

Key Words: Mathematics Achievement, Gender, Secondary Stage, Internet Browsing, Sports Activities, Medium of Instruction

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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."

Subjects like science and mathematics have found a significant place in the curricula of primary and secondary school education. Mathematics has become a substantial and integral part of an organized society. In today's world no one can live without mathematics for a single day.

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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.

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 little reflection will show what predominant role mathematics plays in our everyday life and how it has become an indispensable factor for the progress of our present day world. It is the pivot of all civilization. Each individual is required to compute his or her income and balance, his family budget irrespective of having any formal education of mathematics. This is the subject which undisputed forms the very basis of entire world's commercial system. It is a contributory factor in the prosperity of human race. There is no science, no art and no profession, where mathematics does not held a key position. The accuracy and exactness of a science is determined to a major extent by the amount of mathematics utilized in it. Even social sciences like economics, psychology, geography etc. make abundant use of

mathematics. The gigantic work of construction of dams, bridges, building of ships, airplanes, bombs etc. are possible only because of the quantitative science. Even in medical sciences mathematics is used to measure the doses, the blood pressure, the rate of the pulse, the body temperature etc. Most of the natural sciences and philosophy are to be studied on mathematical lines and without the study of mathematics there would be no improvement in them.

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 emphasize achievement which facilitates among other things, the process of role allocation for the social system.

The school performs the function of selection and differentiation amongst students on the basis of their scholastics and other attainments and open out avenues for advancement again, primarily in terms of achievement. The student at school is trained to accept the hierarchy based on achievement. This helps him to be released from the family status in certain ways his personal status is a direct function of the position he achieves mainly in the formal classroom settings. Acceptance of the system of hierarchy in terms of achievement helps also to integrate the school system.

Achievement in mathematics is the stage of attainment in mathematics by the students, generally expressed in terms of grade or scores. It is defined as performance of students in mathematics tests based on scores. Achievement test is used to measure the degree of mastery of skills, fundamental concepts, process and 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 mathematics has been studied as knowledge, skill, comprehension & application attained in the mathematics.

Student are not always in class, so out of school pursuits also are key factors related to achievement Different pursuit, traditionally labeled extracurricular (Holland & Andre, 1987) or leisure time (Williams, E.H. Haertel, Haertel, & Walberg, 1982), can positively or negatively influence student achievement. The influence of pursuits (e.g. sports, clubs, employment, television) has been argued for decades (Coleman, 1961; Holland & Andre 1987; Marsh 1992). the Zero sum theory, attributed to Coleman, assumes that time spent in non-academic-centered activities will decrease or "subvert" academic achievement by absorbing valuable academic time (Marsh 1991). In a similar view, Porter (1991) argued that heavy nonacademic student activity loads interfere with academic work, decrease the time allotted to complete homework and make the student less ready to participate during school. Therefore, nonacademic activities not only affect the amount of time for academic activities but also may interfere with the instructional process (Porter 1991).

The purpose of this study was to examine the relationship of mathematics achievement (dependent variable) with gender, internet browsing, participation in sports activities and medium of instructions (independent variables) of secondary school students of South-East Bihar (India).

The research questions for this study include the following:

1. Do genders explain differences in the mathematics achievement?
2. Do the types of internet browsing influence the mathematics achievement?
3. Do the categories of sports activities affect the mathematics achievement?
4. Do the types of medium of instruction explain differences in the mathematics achievement?

Method: The present work is a descriptive study investigating if students' mathematics achievement differed significantly to a group of variables such as gender, time spent on internet browsing, participation in sports activities and medium of instructions . The sample consisted of 1944 students of class IX, selected from 36 schools of South-Bihar (India) in which 975 were male and 969 were female students. In this study, schools were categorized on the basis of their medium of instructions. For instance, English Medium schools, where pupils in IX are from all socio-economic strata and are admitted through competitions and Hindi Medium schools, where pupils in IX are from all socio-economic strata and are admitted through competitions.

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 12 common chapters of class VIII mathematics text book (NCERT, New Delhi and Bihar State Education Board, Patna). The test consists of 70 items of multiple choice type representing achievement at various areas of mathematics such as 27 items in arithmetic, 21 items in algebra and 06 items in geometry, 12 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 mathematics. All the 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 0.25 to 0.85 similarly, each item had a discriminating power greater than 0.30. The test was based on the latest syllabus prescribed by the NCERT, New Delhi and Bihar State Education Board, Patna. This test had a fairly high content validity and its reliability is found to be 0.90.

A Personal Background Assessment Questionnaire

The personal information sheet is prepared by the investigator. This sheet contains such questions requiring the subjects to give information on their medium of instruction in the school as well as students' involvement in internet browsing as well as participation in sports activities etc.

Results and Analysis

Data analysis is performed on computer with SPSS 17 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=1942, t=2.40).

Table 1: Comparison of mean mathematics achievement scores of male and female students

Gender	N	Mean score	SD	t-value	df	Sig./Not sig.
Male	975	45.81	14.71	2.40*	1942	Sig. at 0.05 level
Female	969	44.19	15.13			

The total numbers of male and female students were 975 & 969 respectively as indicated by the table 1. Out of 70 scores, the mean achievement scores in mathematics of male student is 45.81 and SD=14.71. In case of female students, the mean mathematics achievement score is 44.19 and SD=15.13. The statistically calculated t-value is 2.40 which is significant at 0.05 level with 1942 df. The result clearly indicates that there is significant difference between mean mathematics achievement score of male and female secondary school students. Both are not equally good but male students are better in mathematics achievement in comparison to female students. Thus the hypothesis stating that "Male and female students do not differ significantly on mathematics achievement" is rejected at 0.05 level of confidence. The graphical presentation of mean mathematics achievement scores of both sexes is given in fig. 1

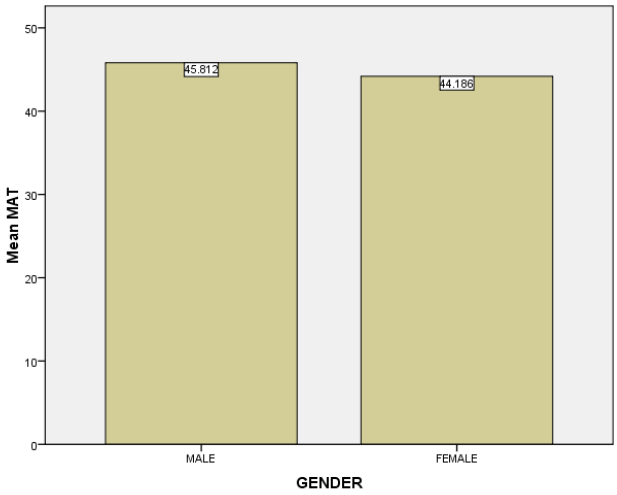

Fig. 5.1 Gender wise graphical presentation of mean mathematics achievement score

Table2: Comparison of mathematics achievement scores among the three categories of internet browsing (I_1= Zero hours, I_2= 1-2 hours, I_3= More than 2 hours) of secondary school students

-Duncan's Mean test

Zero Hour I_1 (N=1514)		1-2 Hours I_2 (N=306)		More than 2 Hours I_3 (N=124)		Significant pairs (*)	F-value
Mean	SD	Mean	SD	Mean	SD		
43.99	15.30	48.85	12.32	47.88	14.60	I_1 Vs I_2 I1 Vs I3	16.16**

** Significant at 0.01 level

The analysis of variance was employed to find out the influence of internet browsing of students on mathematics achievement. The total samples were categorized into three groups i.e. zero hours, 1-2 hours and more than 2 hours on the basis of their habit of internet browsing. The mean achievement scores of three groups of zero hours, 1-2 hours and more than 2 hours of students were found to be 43.99, 48.85 and 47.88 respectively. Analysis of variance of the mathematics scores of the three group yielded F value as 12.13 which is significant at .01 level with df 2, 1941 (table 2). This implied that there is significant overall difference in the means of these groups. Hence F test was found significant therefore Duncan's post hoc test was applied for further investigations.

Further support to this conclusion, it is also provided by a test of significance of difference between the mean mathematics achievement scores of the three types of groups of internet browsing as given in the table 2. The fig 2 shows the mean scores of mathematics achievement of students of three groups of internet browsers.

The statistical method used in testing the major hypothesis was the Duncan's post hoc test for the difference between the means of three groups. The significant pairs obtained by comparing each group mean mathematics achievement score with that of every other group shows that out of three possible paired comparisons only two showed significant difference. Further the table 2 shows that students of group of 1-2 hours use of internet have the highest mathematics achievement scores than the other two groups, then students of more than 2 hour group have higher mathematics achievement scores than zero hour students group.

These analyses do not confirm the prediction hypothesized in this study for the present sample. A relationship between mathematics achievement scores of students and browsing the internet has been demonstrated by the findings. Hence the hypothesis stating that "there is no significant difference among the categories of amount of time on internet browsing and mathematics achievement of students" was partially accepted and partially rejected.

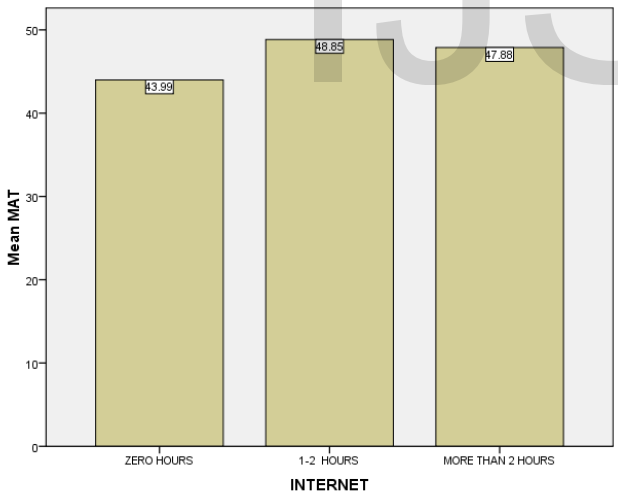

Fig. 2 Presentation of mathematics achievement on the basis of their internet browsing

Table 3: Comparison of mathematics achievement scores among the three categories of participation in sport activities (P_1= Never, P_2= Sometimes, P_3= Always) of secondary school students

-Duncan's Mean test

Never P_1 (N=203)		Sometimes P_2 (N=1199)		Always P_3 (N=542)		Significant pairs (*)	F-value
Mean	SD	Mean	SD	Mean	SD		
39.40	17.66	44.64	14.79	47.90	13.43	P_1 Vs P_2 P_1 Vs P_3 P_2 Vs P_3	25.43**

** Significant at 0.01 level

The analysis of variance was employed to find out the influence of sports activities of students on mathematics achievement. The total sample were categorized into three groups i.e. never, sometimes ad always on the basis of participations of students in sport activities. The mean mathematics achievement scores of never, sometimes and always participation of students in sports activities were found to be 39.40, 44.64 and 47.90 respectively. Analysis of variance of the mathematics scores of the three group yielded F value as 25.43 which is significant at .01 level with df 2, 1942 (table 3). This implied that there is significant overall difference in the means of these groups. Hence F test was found significant therefore Duncan's post hoc test was applied for further investigations.

When Duncan's post hoc test applied for further investigation, the mean scores, standard deviations and significant pairs are given in table 3. The mean scores in mathematics achievement of the above three defined groups (never, sometimes & always) are 39.40, 44.64 and 47.90 respectively. from the trend it is quite clear that as the participation in sports activities increases the achievement in mathematics also increases accordingly, when Duncan's post hoc test was applied to compare each mean with every other mean achievement scores, significant difference were obtained between all the three means with significant pairs (P_1 Vs P_2, P_2 Vs P_3, & P_1Vs P_3). Hence the hypothesis stating that "there is no significant difference among the categories of participation in sport activities and mathematics achievement of students" is rejected. The graphical presentation is given in fig. 3.

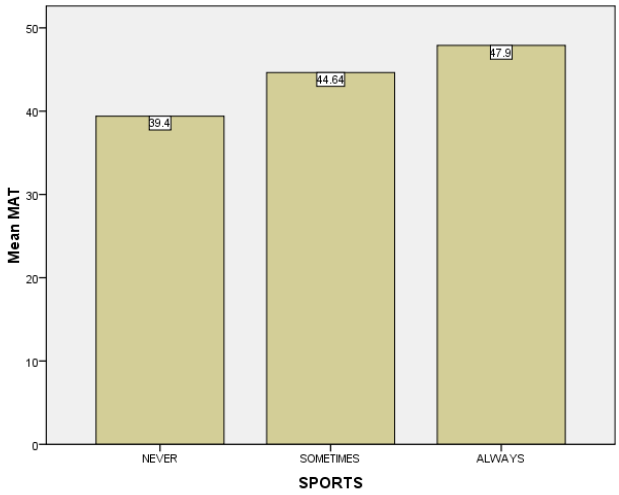

Fig. 3 Graphical presentation of mean mathematics achievement score of three groups of student based on their participation in sport activities

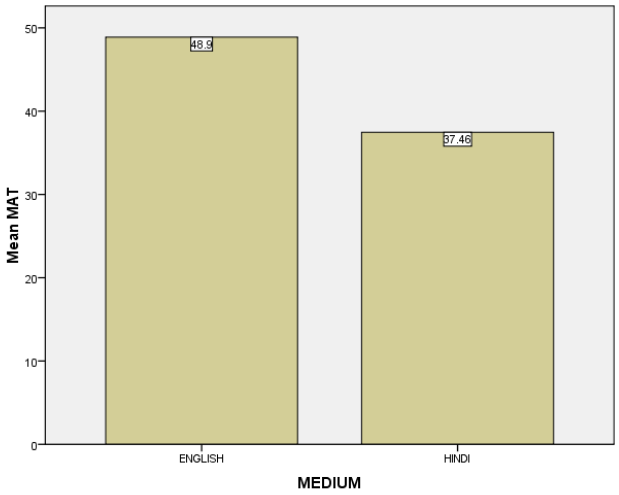

Fig. 4 Graphical presentation of mean mathematics achievement score on the basis of their medium of instruction

Table 4: Comparison of mathematics achievement scores of students on the basis of their medium of instruction

Medium of instruction	No. of students N	Mean	SD	df	t-value	Sig.
English	1282	48.90	12.99	1942	17.16**	0.01 level
Hindi	662	37.46	15.58			

**Significant at 0.01 level

The total numbers of English medium and Hindi medium students were 1282 & 662 respectively as indicated by the table 4. Out of 70 scores, the mean achievement scores in mathematics of English medium student is 48.90 and standard deviation (SD=12.99) in case of Hindi medium students, the mean mathematics achievement score is 37.46 and standard deviation (SD=15.58). The statistically calculated t-value is 17.16; which is significant at 0.01 level with 1942 df. The result clearly indicates that there is significant difference between mean mathematics achievement score of English medium and Hindi medium secondary school students. Both are not equally good and they differ in their mathematics achievement. Thus the hypothesis stating that, "there is no significant difference between medium of instruction and mathematics achievement of secondary school students" is rejected at 0.01 level. The graphical presentation is given in fig. 4.

Discussion

The results of the analysis of data shows that the gender, time spent on internet browsing, participation in sports activities and medium of instruction all had significant effect on mathematics achievement scores in expected direction.

There was significant difference in mathematics achievement scores between boys and girls in the present study. The finding of this study is supported by Asante, K Oppong (2010), Forgasz, Helen (2010) found that generally female students attained higher grades in all other school subjects besides mathematics, science and IT than their male counterparts. Gender differences and the findings on gender differences in mathematics achievement are not newly emerged fact. Long research history in this area has demonstrated that male advantage in mathematics 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 mathematics achievement increases during middle school and becomes more disturbing at the upper secondary level (Fennema et.al. 1998; Fennema, 1985). Friedman (1989) noted that until age 10 either no differences between genders or favoring girls are observed. He observed that 12th grade boys out performed girls, finally, other studies (Fox, Brody & Tobin, 1980) emphasized high mathematics achievement being dominated by males. Deder (1992) has also reported the existence of gender differences in science subject in general as well as in mathematics but 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 mathematics 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 mathematics, have not been consistent and continue to be a much debated topic (Leder, 1992).

The results presented support the idea that internet browsing brings some benefits for students. The result shows that browsing brings some benefits for students. The result shows that internet browsing for 1 hr to 2 hrs per day has increasingly positive effects on achievement of students. The student have no internet browsing and also students who have browsing internet more the 2 hrs per day have increasingly negative effects on achievement. Our results suggest that more time and no time spent on internet browsing have negative effects on the mathematics achievement of high schools students.

Further, another variable which comes up as a major influencing factor for mathematics achievement among students is the types of participation in sports activities. For example mean mathematics achievement score varies on a continuum of high (always) to low (never). The finding is corroborated by Stephen Limpscomb (2007) who reported a relationship between mathematics achievement and sports activities based on percentage analysis.

When data was analyzed to see the significant difference in mathematics achievement scores on the basis of medium of instructions of the schools, it is found that students of English medium achieved significantly more achievement score in mathematics than the students of Hindi medium schools. It is clear that English medium schools have good facilities as compare to Hindi medium schools.

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