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Achievement of Senior Secondary School Students in Mathematics: The Contribution of Intelligence and Socio-Economic Status

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ABSTRACT

An increasing pool of research findings in the field of mathematics education indicate the impact of various factors like demographic, individual, instructional, classroom management and evaluation factors on mathematics achievement of the students. The present study aims to study the significant predictors in mathematics achievements among adolescents. Descriptive survey method was used as a research design for the study. The target population of the study was the students studying in senior secondary schools of Moradabad city in Uttar Pradesh (India). A sample of 123 students was randomly selected out of 5 senior secondary C.B.S.E. schools out of which 66 were males and 57 females. The study revealed that Intelligence emerged as the most significant predictor in mathematics achievement among adolescents. This is in consistent to previous researches conducted by Das (1986), Patel (1997), Kasat (1991), Abdulmajeed (1992) and Fernandez (2011), who reported positive relationship between the intelligence and mathematics achievement.
INTRODUCTION

Education is a very vital tool that is used in contemporary world to succeed. It is important because it is used to overcome most of the challenges faced in life. The knowledge that is attained through education helps open doors to a lot of opportunities for better prospects in career growth. It is believed that the grades attained by students in academics contribute greatly to the success one attains in future. Higher achievement in academics enhances the chances of succeeding in the career path one wants to take in his or her life. Academic achievement represents performance outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of activities in institutional environment, especially in school, colleges and university. The importance of academic achievement in not only psychological and educational researches but also in regard to individual and societies is very well highlighted by Spinath (2012). Large-scale scholastic achievement assessments such as PISA provide an overview of the current state of research on academic achievement. Studies conducted by Walberg(1986), Hattie (2009) and Spinathi(2012) have investigated and established predictors of academic achievement on an international level. Academic achievement especially in the subject like science and mathematics are considered to be of utmost relevance by the society as it is believed to mirror the intellectual capacity of the person.

Mathematics has become a substantial and integral part of an organized society. Mathematics is fundamental to national prosperity in providing tools for understanding science, engineering, technology and economics. Despite innumerable the usefulness of mathematics in every sphere of our life, there has been a general perception among students that mathematics is one of the most difficult subjects and therefore only intelligent students should opt mathematics at higher level of studies. Students’ mathematics achievement is often associated with the future of a country (Baker & LeTendre, 2005; Wobmann, 2003). Thus, the desire to understand and identify factors that may have meaningful and consistent relationships with mathematics achievement has been commonly shared among national leaders, policy makers and educators around the world. Various investigators have studied numerous variables which were found accountable for the success or failure of mathematics. An increasing pool of research findings indicate there are various factors like demographic, individual, instructional, classroom management and evaluation factors that have an impact on mathematics achievement of the students. Intelligence, aptitude, attitude, anxiety, adjustment, creativity, socio-economic status and gender are among the few variables which are found to have a significant influence on mathematics achievement.

Intelligence is conceived as a general mental power or multiplicity of mental powers that could be measured on a vertical scale by a single score. It has been argued that more intelligent pupil tend to score higher in mathematics than their less intelligent counterparts. Fernandez (2011) found positive relationship between intelligence and specific areas of mathematics achievement, similarly, Das (1986), Patel (1997), Kasat (1991) and Abdul Majeed (1992) observed positive correlation between intelligence and Mathematics Achievement.

The issue of socio-economic status and its relationship to mathematics achievement remains as an intriguing aspect of students mathematics achievement among researchers. A number of studies have revealed significant correlation between SES and learning outcomes in mathematics (Eamon, 2005; Jeynes, 2002; Hochschild, 2003). On the contrary, Groenenboer & Hemmings (2007) and Mustafa (2009) found that students from the higher SES groups scored more marks than the low SES groups.

Gender differences in mathematics achievement has been a great issue of concern in educational domain and research documents show great discrepancies among girls and boys performance in school mathematics (Sprigler & Alsup,2003) Some recent studies have revealed that gender differences in mathematics education seem to be narrowing in India and abroad. However, studies indicate that as students reach higher grades, gender differences favor increase in maths achievement by males (Campbell, 1995; Gray, 1996; Mullis, Martin, Fierros, Goldberg & Stemler, 2000).

Significance of the Study

All the above studies reflect that in some cases, variables like intelligence, socio-economic status and gender differences has a role to play in mathematics achievement of students. Though it appears that the variables undertaken are significant predictors of mathematics achievement, yet they need to be subjected to scientific corroboration. This will be a significant contribution of this study to knowledge apart from providing empirically based suggestions.

Objectives

1. To identify the significant predictors of achievement in mathematics and their extent of predictability.
2. To study the relative influence of intelligence on students’ achievement in mathematics.
3. To study the relative influence of students’ socioeconomic status on their achievement in mathematics.
4. To examine the relationships between dependent variable (mathematics achievement) and independent variables (intelligence and socio-economic status).
5. To study the gender differences in students’ intelligence, socio-economics status and mathematics achievement.
Hypotheses

1. None of the predictive variables will be found to be the significant predictors of students' achievement in mathematics.
2. There will be no significant effect of students' intelligence on their achievement in mathematics.
3. There will be no significant effect of students' socioeconomic status on their achievement in mathematics.
4. There will be no significant relationship between students' intelligence, socioeconomic status and their achievement in mathematics.
5. There will be no significant gender differences between in students’ intelligence, socioeconomic status and their achievement in mathematics.

Research Assessment Tools

The researcher used the standardized tools for the collection of data for the present study. Group test of intelligence by Ahuja (2009) was used to know the intelligence of the students. The socioeconomic status of the sample was obtained through socio-economic status scale (urban and rural) by Kalia and Sahu (2005) and High School C.B.S.E. board exam scores in Mathematics was considered as their achievement in Mathematics.

Statistical Techniques Used

The researcher used the following statistical techniques for the analyses:

Multiple regression and linear regression were used to know the strength of the predictors. With the help of Pearson product moment correlation the researcher was able to determine the relationship between dependent and independent variables. While t test helped in knowing the significant differences between the variables.

DATA ANALYSIS AND FINDINGS

Objective 1. To identify the significant predictors of achievement in mathematics and their predictability.

In the table 1, intelligence and socio-economic status together account for 25.3% of the total variance in students’ achievement in Mathematics (R square = 0.253, p<0.05). The percentage is significant. Thus, in a students’ high achievement in mathematics, intelligence and socio-economic status have a role to play. Hence, the null hypothesis is rejected here.

Objective 2: To study the relative influence of intelligence on students’ achievement in Mathematics.
Table 2: Relative Influence of Intelligence on Students’ Achievement in Mathematics

<table>
<thead>
<tr>
<th></th>
<th>Sum of square</th>
<th>Df</th>
<th>Mean square</th>
<th>F</th>
<th>Sig. value</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>4209.982</td>
<td>1</td>
<td>4209.982</td>
<td>38.305</td>
<td>0.000</td>
<td>*Significant (p&lt;0.05)</td>
</tr>
<tr>
<td>Residual</td>
<td>13298.652</td>
<td>121</td>
<td>109.906</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17508.634</td>
<td>122</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the table 2 above, students’ intelligence alone accounts for 24.0% of the total variance of performance in mathematics (R square = 0.240, p<.05). This percentage is significant. Thus, high intelligence leads to high achievement in mathematics. Hence, rejecting the null hypothesis.

Table 3: Relative Influence of Students’ Socio-Economic Status on their Achievement in Mathematics

<table>
<thead>
<tr>
<th></th>
<th>Sum of square</th>
<th>Df</th>
<th>Mean square</th>
<th>F</th>
<th>Sig. value</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>30.622</td>
<td>1</td>
<td>30.622</td>
<td>.212</td>
<td>.646</td>
<td>Not significant</td>
</tr>
<tr>
<td>Residual</td>
<td>17478.012</td>
<td>121</td>
<td>144.446</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17508.634</td>
<td>122</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the table 3 above, students’ socioeconomic status accounts for only .2% of the total variance in mathematics achievement, (R square = .002). This percentage is insignificant. Thus, the null hypothesis is accepted that there is no significant effect of socioeconomic status on students’ achievement in mathematics. Thus results are in the harmony of the similar research findings by Rajyaguru (1991), Abdulmajeed (1992) and Thampurathy (1994), who reported very little rather negligible impact of the socioeconomic status on mathematics achievement.

Objective 3: To study the relative influence of students’ socioeconomic status on their achievement in mathematics.

Table 4: Correlation Matrix of Students’ Achievement in Mathematics, Intelligence and Socio-economic Status

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mathematics achievement</th>
<th>Intelligence</th>
<th>Socio-economic status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maths achievement</td>
<td>1.000</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Intelligence</td>
<td>.490*</td>
<td>1.000</td>
<td>---</td>
</tr>
<tr>
<td>Socio-economic status</td>
<td>.042</td>
<td>-.141</td>
<td>1.000</td>
</tr>
</tbody>
</table>

From table 4 above, it was found that the highest positive significant relationship existed between students’ intelligence and their mathematics achievement (r = .490, p<0.05). This is in consistent to previous researches conducted by Das (1986), Patel (1997), Kasat (1991), Abdulmajeed (1992) and Fernandez (2011), who reported positive relationship between the intelligence and Mathematics achievement. An insignificant relationship was found between socioeconomic status and students’ mathematics achievement (r = .042). This finding was contrary to the findings of Segars (1995), Piearey
They had highlighted the positive contribution of the SES to the achievement in mathematics. The table also revealed a negative and insignificant correlation between intelligence and socio-economic status. Therefore, the null hypothesis is partially accepted.

**Objective 5:** To study gender differences in students’ intelligence, socioeconomic status and their mathematics achievement.

**Table 5: Comparison of Male and Female Students’ Intelligence, Socio-Economic Status and Mathematics Achievement**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>Std. dev.</th>
<th>Std. error</th>
<th>Df</th>
<th>T</th>
<th>Sig. value</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligence</td>
<td>Male</td>
<td>66</td>
<td>69.24</td>
<td>17.895</td>
<td>2.203</td>
<td>121</td>
<td>-.576</td>
<td>.566</td>
<td>N.S.</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>57</td>
<td>71.21</td>
<td>20.024</td>
<td>2.652</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td>Male</td>
<td>66</td>
<td>64.20</td>
<td>11.090</td>
<td>1.365</td>
<td>121</td>
<td>-</td>
<td>.000</td>
<td>Sig.</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>57</td>
<td>74.51</td>
<td>11.811</td>
<td>1.564</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics achievement</td>
<td>Male</td>
<td>66</td>
<td>72.68</td>
<td>12.953</td>
<td>1.594</td>
<td>121</td>
<td>-</td>
<td>.008</td>
<td>Sig.</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>57</td>
<td>78.37</td>
<td>10.012</td>
<td>1.326</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In table 5 above, there is no significant difference between male and female students’ intelligence. But at the same time there exists significant difference between male and female students’ socioeconomic status and their achievement in mathematics. The results are in corroboration with the findings of Houston (1980), Metcalf (1986) and Prakash and Pandey (1996). These studies revealed that gender has a significant effect on mathematics achievement. Hence, based on the above findings null hypothesis is partially accepted.

**CONCLUSION AND SUGGESTIONS**

Results of the present study revealed the significant contribution of intelligence and socio-economic status in students’ mathematics achievement. Intelligence was found to be strong and significant predictor of mathematics achievement. On the other hand socio-economic status came out to be an insignificant predictor in mathematics achievement. Intelligence was found to be strongly and positively related to mathematics achievement but at the same time socio-economic status had weak but positive correlation with mathematics achievement while negative insignificant correlation existed between intelligence and socio-economic status of students. Gender differences were found to be significant in socio-economic status and students’ mathematics achievement. The gender differences were insignificant in only intelligence.

In the light of the above findings, it can be now said with a reasonable degree of confidence that intelligence has been found to be playing a vitally constructive role for students’ achievement in mathematics. It calls for an immediate attention of the parents and teachers to provide extra care, educational efforts and encouragement to better utilize a students’ potential abilities for upward movement with reference to their achievement in mathematics. The findings highlight the significant gender differences in mathematics achievement. Considering the importance of mathematics education as an important tool in nation building, emphasis should be given to building up awareness of this subject to all the students because mathematical knowledge as well provides the possibility of choice. A strong mathematics foundation at secondary school level cannot be overlooked to fulfill the necessary mathematics requirements at college level. Moreover, more and more careers are dependent on college level mathematics, so it is quite essential to not only master mathematical skills but also to understand concepts.

**REFERENCES**
