Factors Affecting Academic Performance of Senior Secondary Science Students: An Exploratory Study in Himachal Pradesh

[a]Piar Chand, [b]Himanshu Sharma
[a]Professor, Department of Humanities and Social Sciences, National Institute of Technology, Hamirpur (H.P.), 177001, India
[b]Research Scholar, Department of Humanities and Social Sciences, National Institute of Technology, Hamirpur (H.P.), 177001, India

Abstract

A plethora of studies on the factors affecting academic performance of students at primary and elementary levels are available in the literature. However, very few studies have looked into the factors affecting academic performance of students at senior secondary level. Against this background, this paper raises and seeks to answer the question as to what determines the academic performance of senior secondary science students. This paper attempts to answer this question, through an exploratory study of the academic performance of 450 science students from 50 senior secondary schools spread over three most literate districts namely, Hamirpur, Una and Kangra of Himachal Pradesh, India. A multiple regression model has been employed to quantify the impact of different factors affecting the academic performance of students measured by their score in 12th class board examination. We found that academic performance of senior secondary students is significantly influenced by hours of self study, score in tenth class, family income, mother's education, working mothers, social group, teacher's salary and teaching experience.

KEYWORDS: Academic Performance, Senior Secondary Schools

INTRODUCTION

In the era of globalization and technological revolutions, education plays a vital role in the development of human capital. It is considered as a priority sector for development by all nations. Education is closely linked to a person's life chances, income and well being (Battle and Lewis, 2002).In order to occupy a leading role in world's economy, the education system of a country must produce students who can compete in global job market. Recent findings, that cognitive achievement is statistically important in determining worker's productivity imply that the academic performance of students in school has important implications for economic growth (Boissiere *et al*, 1985; Kingdon, 1999). Student performance is also meant for making a difference locally, regionally, nationally and globally (Farooq *et al*, 2011).International surveys such as Program for International Student Assessment (PISA) for OECD (Organization for Economic Co-operation and Development) countries have been focusing on relative rankings of countries on the basis of students average performance in science, mathematics and reading. The academic performance of students is also used by policy makers to analyze the translation of educational inputs into outputs (Aslam, 2003). The academic performance of students in school also affects their further educational attainment. It has been observed that most of the students having higher academic performance in secondary (10th class) board examination prefer to join

science stream in senior secondary classes. This is because students studying science have better opportunities for joining professional courses like engineering, medicine, pharmacy etc. Therefore, it would be interesting to understand the factors that benefit and hinder their academic performance.

There is a considerable debate in the literature about the determinants of academic performance. In developed countries the studies by Coleman (1966) and Comber and Keeves (1973) concluded that student performance is overwhelmingly determined by home background factors than by school quality. Their conclusion was however, challenged by Heyneman & Loxley (1982) who argued that whereas in developed countries home background of students mattered much more, the reverse was true in low-income (developing) countries. In a study on children aged 13-14 years in one of the Indian states, Kingdon (1999) found that home background and school influences are both important to student achievement. A number of other studies[1] in developed and developing countries have also examined the effect of various factors on student academic performance. While some studies found personal characteristics of students such as gender, self-effort, taking tuitions etc. and socio-economic factors like parents education, family income, number of siblings etc. as significant determinants of the student performance, others have found the effect of school related factors like class size, school resources, teacher salary etc. The relative effectiveness of these determinants has remained a debatable matter in the absence of any conclusive evidence. Furthermore, most of these studies have mainly focused primary or middle level schooling and very few studies have examined the factors that affect the performance of the students at senior secondary levels. This study attempts to identify the factors that determine the academic performance of students studying science in senior secondary schools in the state of Himachal Pradesh.

METHODOLOGY

Research Design

The study uses descriptive research design which involves description of dependent variable in relation to independent variables. Keeping in mind the nature of the present study this research design has been followed. Implicitly this design also involves collection and analysis of data. Review of literature also indicates that descriptive research design has been most frequently used by the researchers in this type of studies.

Universe of the study

The state of Himachal Pradesh consists of 12 districts namely, Bilaspur, Chamba, Hamirpur, Kangra, Kinnaur, Kullu, Lahul & Spiti, Mandi, Shimla, Sirmour, Solan and Una. As per 2011 census, the literacy rates in these districts vary from 73 % in Chamba to 89 % percent in Hamirpur. The present study has been carried out in three most literate districts of Himachal Pradesh, namely Hamirpur (89.01%), Una (87.23%) and Kangra (86.49%). All the senior secondary schools having science stream within the geographical boundaries of these districts constituted universe of this study. There were 96 such schools in these districts.

Sample

We have selected those senior secondary schools where the minimum strength of science students in the 12^{th} class was 50 or more. This criterion covered 50

schools which were taken for the present study (Table1). A sample of 450 students was selected and distributed proportionately among three districts on the basis of the total number of science students in all the three districts in order to have a better representation of the population of students in each district. The students were then distributed among different schools in each district on the basis of student strength in class 12th. The students allotted to each school were then selected following simple random sampling.

Data Collection

Two types of structured questionnaires were designed and pre-tested by the researcher. While the first questionnaire pertained to the collection of data from schools, the second questionnaire was used to collect data from students. The data was collected from the respondents using personal interview method for the year 2009-2010. School questionnaire contained questions on various aspects of the school such as year of establishment, resources, student strength, and details of teachers and so on. The student questionnaire contained questions on personal characteristics like age, gender, hours of self study, hours of tuition etc and family background such as parental education and occupation, family structure, wealth and income. The scores of the selected students in 12th class board examination were noted from the school records.

Data Analysis

Data is analyzed using descriptive statistics. The influence of different personal, socio-economic and school related factors on the academic performance of students is quantified by using multiple regression model of the following form:

$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + \ldots\ldots\ldots\ldots\ldots\ldots + U$

Here, '*a*' is a constant, b_1, b_2, b_3, b_4 etc are regression coefficients, Y is the academic performance (dependent variable) measured by the score of the students in 12th class examination and X_1, X_2, X_3, etc. are personal, socio-economic and school related factors (independent variables). U is a random term that accounts for unobserved factors.

Results and Discussions

The descriptive statistics are calculated in order to analyze the data collected from students and schools on various aspects. Table 2 provides descriptive statistics of the sample. It is evident from the table that 54% of the students in the sample are males. Likewise, majority of the students belong to higher social group and come from rural background[2]. Also, 50% students are taking private tuition after school hours. The average education years of fathers are more than those of mothers. Nearly one-fifth (19%) of mothers are working in government or private profession. It must also be noted here that majority (75%) of the students are interested to join a professional course in engineering or medicine after passing their 12th class.

The effect of different factors on the performance of students has been studied and results are reported in Table 3. The indices in the table give regression coefficients and't' values. The adjusted R^2 gives the variations in the academic performance explained by various personal, socio-economic and school related factors included in the regression model. The F value gives the overall significance of the regression model. The value of adjusted R^2 in the regression

model reveals that almost 45% of the variations in the dependent variable have been explained by the independent variables included in the regression analysis. Among the personal characteristics of the students, hours of self-study (H_SS) has the positive and statistically significant impact on the performance of students in 12th class board examination suggesting that longer hours of self-study enhance performance. Kingdon (1999) and Kingdon and Teal (2002) have also found that longer hours of home study enhance learning and improve academic achievement. Past academic score, measured in term of score in tenth class board examination (SCORE_10), has also been found to have a positive and significant effect on student performance. The effect of past academic performance has also been found positive by Barry (2006) and Dahar *et al*. (2011). Interestingly, going for tuitions (TAKES_TU) had an insignificant negative effect on the performance of students. This implies that tuitions are merely wastage of time. Aslam (2003) in his study on 8th grade students in Pakistan also found negative effect of private tuition. The results show that the gender of the students is having an insignificant effect on the academic performance. Travel time to school (TIME_TR) has a positive but insignificant effect on achievement, reflecting perhaps that students who come from distant places are more conscious of their performance. Similar result was reported by Kingdon (1999), who observed that travel time to school has a positive but small effect on students' achievement. Participation of students in extra-curricular activities (EXTRA_ACT) in the last year of their schooling and time spent by them in watching television (TIME_TV) is observed to have a negative and statistically insignificant effect on their performance. Similarly, perusing an aim to join a professional course (AIM_PROF) after 12th did not influence the academic performance of students.

Furthermore, father's education (F_EDU) has a negative and insignificant effect on the academic performance of students, mother's education (M_EDU) has a significant positive effect. The educated mothers contribute effectively for the overall performance of their children by motivating them for study. Positive effect of mother's education is also observed by Suryadarma *et al.* (2004), Byamugisha (2010) and Duncan & Sandy (2007). We also found that family income (FAM_INC) had a significant effect on student's performance. Naturally, the higher economic status of parents determines their ability to provide inputs like stationary, books, table, chair, etc for improving their study environment. This finding is in accordance with the findings of Kingdon (1996), Wenglinsky (2007) and Aslam (2003). Belonging to a rural background is having an insignificant effect on the academic performance of students. However, when we consider the category characteristics, the performance of students belonging to higher social group category (SG), is significantly better than their reserved category counterparts. Similar results for category variables have been observed by Goyal (2007), Kingdon (1999) and Kingdon and Teal (2002). Working mothers (M_WORK) have a positive but insignificant effect on the performance of children. A large number of siblings in a household (NUMB_SIB) exerts no significant effect on the academic performance of students.

Among school related variables, teaching experience of the teachers (TEACH_EXP) is observed to have a significant negative effect on the performance of students indicating that a longer teaching experience has a negative impact on student performance. It is just possible that senior teachers

having longer teaching experience do not consider it essential to revise or update themselves with new trends in their subjects and may also be vested with additional responsibilities, thus affecting their teaching work adversely. It may be mentioned that similar finding is also reported by Dahar *et al.* (2011). Analysis of our data also reveals that there is a positive and significant effect of teacher salary (TEACH_SAL) on the academic performance. This result is consistent with the findings of Kingdon and Teal (2002) who concluded that schools get significantly better results by relating salary to academic achievement. The student teacher ratio (STR) has an expected negative *albeit* insignificant effect on student performance. Kingdon (1999) also found no significant relationship between STR and academic performance of students. Interestingly, rural location (LOC_RURAL) of the school is having a positive but insignificant effect on academic performance of students. Value of the infrastructural assets of schools measured by RESOURCE has also positive but insignificant effect on academic performance of students. Nasciemento (2008) while reviewing literature on the effect of school resources on student achievement in developed and developing countries reported that the effect of school resources on student achievement is equivocal and may suffer from endogeneity bias[3].

CONCLUSIONS

This study addresses the basic question as to what are the determinants of academic performance of senior secondary science students. The results of our study demonstrate that among personal factors, hours of self study put in by students and their scores in previous board examination of 10^{th} class are significant determinants of performance. Among the socio-economic factors, mother's education, working mothers, family income and higher social group emerge as significant predictors of academic performance. Within the school related factors, while teacher experience is having a significant negative impact on student performance, the effect of teacher salary is positive and significant. In brief, our findings as regards the determinants of the academic performance of students in senior secondary classes are consistent with those who found that a mix of personal, socio-economic and school related factors affected the academic performance of students at primary and elementary level.

End Notes

[1] See for example, Aslam(2003), Aslam(2007), Suryadarma *et al.*(2004), Kingdon(1999), Kingdon and Teal(2002), Goyal(2007), Barry(2006), Byamugisha(2010), Farooq *et al*. (2011), Thapa, (2011)

[2] As per 2011 census, about 90% of the population in Himachal Pradesh is residing in rural areas.

[3] The term *endogeneity* refers to the fact that the resources are not randomly allocated to the schools and depend on factors like financing rules, school performance and parental choices (Nasciemento, 2008)

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Table-1 Distribution of Sample

	Hamirpur	Kangra	Una	Total
Schools	13	28	9	50
Students	133	231	86	450

Table-2 Descriptive Statistics

Factors	Description	Mean	Std. Deviation
Personal Factors			
PERFORMANCE	Student's score in 12th Class	70.25	10.88
H_SS	Number of hours of self study at home	4.11	1.38
SCORE_10	Score in 10th class Board Exam	75.24	10.11
TAKES_TU	Student takes private tuition? Yes=1,No=0	0.50	0.50
MALE	Student's gender; Male=1,Female=0	0.54	0.49
TIME_TR	Time of travel to and from school in minutes	44.64	33.17
EXTRA_ACT	Participates in extra- curricular activities? Yes=1,No=0	0.68	0.46
TIME_TV	Time spent on watching TV in hours	1.38	0.96
AIM_PROF	Aims to join Professional degree course in engineering or medicine? Yes=1,No=0	0.74	0.43
Socio-Economic Factors			
F_EDU	Father's education in years	12.77	2.85
M_EDU	Mother's education in years	11.29	3.13
FAM_INC	Family Income in rupees	214073.7	2.70301.0
SG	Social Group: Higher(General)=1, Lower(SC,ST, OBC)=0	0.75	0.43
RURAL	Student's social background Rural=1,Urban=0	0.79	0.40
M_WORK	Mother working? Yes=1,Housewife=0	0.19	0.40
NUMB_SIB	Number of siblings in the household	1.48	0.86

School Related Factors TEACH_EXP	Teaching experience of teachers in years	6.41	2.34
TEACH_SAL	Monthly salary of teachers in rupees.	14941.5	6396.8
STR	Student Teacher Ratio	20.83	9.34
LOC_RURAL	Attending a rural school=1, Others=0	0.51	0.50
RESOURCE	Present monetary value of physical facilities and teaching aids in schools in rupees	2573000.0	2593820.0

Notes: For 0/1 variables, the mean represents the proportion of ones in the sample.

Table-3 Determinants of Academic Performance of Students: Results of Regression Analysis

Variable	Coefficient	t-value
CONSTANT	27.87	**6.41***
Personal Factors H_SS	0.43	11.00*
SCORE_10	0.31	7.71*
TAKES_TU	-0.03	-0.68
MALE	0.02	0.41
TIME_TR	0.04	1.05
EXTRA_ACT	-0.05	-1.31
TIME_TV	-0.01	-0.30
AIM_PROF	0.00	0.08
Socio-economic factors F_EDU	-0.04	-0.77
M_EDU	0.08	1.58***
FAMILY_INC	0.08	2.11*
SG	0.07	1.91**
RURAL	0.03	0.69
M_WORK	0.07	1.58***
NUMB_SIB	-0.02	-0.61
School Related factors TEACH_EXP	-0.19	-3.45*
TEACH_SAL	0.19	3.47*
STR	-0.01	-0.32
LOC_RURAL	0.04	1.05
RESOURCE	0.04	1.04
N	450	
R^2	0.45	
Adj. R^2	0.42	
F	17.39	
Mean of dependent variable	70.25	

Note: *, **, *** denote the level of significance at 0.01, 0.05 and 0.1 respectively.