Factors Affecting Academic Achievement of Students at Bole Senior Secondary School

Mathewos Tamiru[*]

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Introduction

The academic performance of students can be affected by a number of factors. Some studies have shown that factors associated with family background significantly affect the academic achievements of students (Chopra, 1967; Dougherty, 1981). Other studies have demonstrated that the educational background and health conditions of students, school environment, parental involvement and social factors not only exert a great influence on the students attitude towards learning, but also affect the achievements of students (Maslow, 1954;

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Introduction

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Miner, 1968; Nettles, Thoeny and Gosman 1986; Keith and Reimers, 1987; Cohn and Rossmiller, 1987).

However there are some inconsistencies in the results obtained from different studies. Wiseman (1964) indicated that the inconsistencies in the results might arise from regional differences. According to Wiseman, since sampling is so difficult and regional differences are so strong, the replication of research is clearly desirable especially in geographically, economically and culturally different regions.

Most of the studies on factors that affect academic achievements have been conducted in the economically developed countries such as the U.S.A. and Britain. Therefore, it would be beneficial to examine the impact of different types of factors on the academic achievements of students in the high schools in a developing country like Ethiopia.

Review of Related Literature

Many attempts have been made by various scholars to identify factors that affect academic achievement of students in different countries. Several studies have been conducted in this area to investigate the effects of various factors related to schools and the type of programs carried out in schools. Still other studies addressed socio-economic factors, school and instructional variables, educational background and health conditions of students, etc.

One of the factors that is considered crucial in terms of learning concerns the physical well being of students. Maslow (1954) puts physical well being in the first order of priority in relation to people's over-all ability to function in life and in relation to academic achievement in particular. Not only health conditions but also sociological variables, that is, general categories of social class, family structure, sibling structure, and religion affect the academic achievement of students (Miner 1968).

Nelson (1969) studied school achievement of adolescent children with working and non-working mothers. The study was made to find out if there was any difference in school achievement among 312 ninth-grade students who were categorized according to their mothers' work history. His findings revealed that there was no significant difference in school achievement among the children whose mothers worked full-time, part-time or whose mothers' were jobless. The findings also revealed that boys and girls did not differ in school achievement among the three maternal employment groups. Sometimes students were also engaged in part time employment to cover school fees. Jaquess (1987) studied the effect of part time employment on academic achievement of high school students. The sample included 196 non-employed and 281 employed students from Moore high school, Oklahoma. He reported that the non-employed students' grade-point averages were higher than the grade-point averages of the employed students, though the difference was not significant at 0.05 level. That shows the academic performance of high school students is not significantly affected by part-time employment.

Fehrman, Keith and Reimers (1987) studied 28,051 high school students to determine the effect of parental involvement on students' grades in the high school. The results of the study showed that the direct and indirect involvement of parents in the education of their children affected their grades in their high school study. According to the study, high school students would get high scores, if parents encouraged them, monitored their daily activities and school progress and gave them general academic guidance and support. Although Johnston and Juyono (1983) mentioned the importance of the school and personal factors in determining the academic achievement of students, they identified the family background as the most important factor. They suggested that a student might be in a better position to raise his level of academic achievement if he lived in a place where encouragement and support were provided for his study. However support was only possible if parents had an appreciable income.

In a study that involved 1359 randomly selected students (aged 14-17 years), Chopra (1967) examined the relationship between parental occupation and the academic achievement of high school students. Using analysis of variance, he concluded that there was a positive relationship between the level of parental occupation and the mean achievement scores of high school students. In another study, Chopra (1969) demonstrated that achievement in English, Mathematics and Science had a positive relationship with economic background. That is, the mean marks scored by the students in the higher socio-economic group were significantly higher than those of the students from the middle and the lower socio-economic groups.

In a review made by Cohn and Rossmiller (1987), the Coleman Report (1966) created the impression that student's family, peers, and general social milieu exerted much more influence on learning than the school factors. In another review, made by Dougherty (1981), school resources such as per-pupil expenditures and amount of teacher training, did not seem to have much more effect on educational attainment of students than the family background factors. According to the review, family background factors were considered as the most important factors that exerted strong influence on the academic achievement of students. However another research report conducted mainly by World Bank staff indicated that schools were more important factors than family background (Cohn and Rossmiller, 1987). Their review indicated that schools made a difference in how well and how much students learned, and the academic achievement of students was strongly related to the characteristics of learning environment.

Ademe and Gebre (1990) studied the impact of objective type tests on the learning process of high school mathematics. They based their study on selected section of the Tana Haik Comprehensive Secondary School in Bahir Dar and administered objective and subjective types of mathematics tests to sample sections. The study indicated that, the students scored

significantly higher grades in the objective test, while they failed to do most of the problems when framed in the "work out" format.

From the reviews of related literature, we have seen that different factors such as health condition, family and school factors, etc. exert great influence on the students' attitude towards learning and affect their achievements. Unfortunately, reports of research concerning the factors that influence the academic achievements of students at high school levels are scanty in Ethiopia. So, the research presented in this paper attempts, at least in part, to fill this gap concerning factors that affect academic achievements of students at high school levels.

Objectives of the Study

The study aims at investigating the degrees of influence of factors that affect the academic achievements of students: The study considers family background, parental involvement and factors related to the students with special reference to Bole Senior Secondary School. The main objectives of the study are:

- ♦ to examine the extent to which the variables discriminate between high and low achievers, and

- ♦ to find out the most important variables which can be used in discriminating the two groups of students.

Significance of the Study

The findings of such a study are expected to have practical utility in the teaching and learning process in the high schools. It will help the academic and administrative staff in being aware of the variables which can have positive and negative effects on the academic achievements of the students. Educational experts, policy makers and others concerned may use the results of this study in implementing educational policies. Moreover, other researchers may find the study useful.

Methods of Study

The study population consists of students in grade 9 and 11 who were registered during 1994/95 academic year in Bole Senior Secondary School. On the basis of their average scores, those who scored greater than or equal to 65 points out of 100 were placed as high achievers and others who scored less than or equal to 45 was classified as low achievers. 1088 students were used as the study population of which 629 were grade nine students and 459 were grade eleven students. A sample of 124 students was taken of which 72 were grade nine students and 52 were grade eleven students by using stratified sampling with a proportional allocation (Cochran, 1977) so that the sample was approximately representative of the two strata. After stratification a simple random sampling was used to select students from each grade. It was decided to use a 19 per cent control sample. Of the 124 observations, 24 were assigned to the control sample and the remaining 100 were used as the analysis sample. The justification for dividing the total sample into two groups is that an upward bias will occur in the predictive accuracy of the discriminate function if the students used in developing the classification matrix are the same as those used in computing the function.

A questionnaire was designed and used to get the necessary information on the students attitudinal, educational, economic and social backgrounds. The researcher selected items for a questionnaire, which included questions initiating open-ended answer and pre-defined answer categories. To ensure communication, after necessary adjustments were made, the Amharic version of the questionnaire was used and administered to all 124 students. To eliminate any handicap to poor readers, all items were read aloud by the questionnaire administrator and the students responded on their own copies. They were encouraged to ask for clarifications on any questions that they had trouble in understanding.

The questionnaire contained the following factors:

Personal characteristics, background and effort of each student factor.- This factor includes variables such as sex, age, type of school attended, distance from home, length of study time, efforts made on home work and assignments, time spent in the library, number of days absent from school due to health problem, getting adequate meals and how spare time is spent.

Family background factor.- It includes variables such as father's schooling and occupation, mother's schooling and occupation, closest relative and friends' schooling and occupation, and estimated gross family income of the respondents.

Parental involvement factor.- This includes variables such as monitoring of activities by parents, family's financial and moral support and support through the tutorial program.

There are twenty-four variables and each variable is thought to influence the students' academic achievement. Some of these variables are discrete, and others are continuous. The variables included in the study are presented in Table 1.

Because the responses of almost all the students were found to be identical, four of the twenty-four variables were not examined in detail. That is 95% of the students who reported that they made efforts on homework, were provided with adequate meals, and friends' schooling was of their grade level, respectively. 91% of

Table 1: Variable Description

Variable designation	Definition	Measurements
X_1	Sex	Dummies with male coded 1 and female coded 0.
X_2	Age	In completed years.
X_3	Types of school attended	"Government" coded 1, "Mission" coded 2, "Private" coded 3 and "others" coded 4.
X_4	Study hours.	Kilometers away from school
X_5	Length of study time per week	Study hours.
X_6	Efforts made on homework and assignments	Dummies with "yes" coded 1, and "No" coded 0.
X_7	Time spent in the library per week	Hours spent in the library.
X_8	Habit of borrowing books	Dummies with "yes" coded 1 and "No" coded 0.
X_9	Study time with their classmates	Dummies with "yes" coded 1 and "No" coded 0.
X_{10}	Number of days absent from school due to health problem last semester	Days absent from school.
X_{11}	Getting adequate meals	Dummies with "yes" coded 1 and "No" coded 0.
X_{12}	How spare time is spent	"Helping parents" coded 1, "Recreation" coded 2, "Reading different books and magazines" coded 3, and "Going to church and doing part-time work" coded 4.
X_{13}	Father's schooling	Years of schooling.
X_{14}	Father's occupation	"Government employees" coded 1, "private business" coded 2 and "Jobless" coded 3.
X_{15}	Mother's schooling	Schooling.
X_{16}	Mother's occupation	"Government employees" coded 1, "private business" coded 2 and "jobless" coded 3.
X_{17}	Closest relative's schooling	Years of schooling.
X_{18}	Closest relative's occupation	"Government employees" coded 1, "Private business" coded 2 and "Jobless" coded 3.
X_{19}	Closest friend's schooling	Years of schooling.
X_{20}	Closest friend's occupation	"Government employees" coded 1, "private business" coded 2 and "Jobless" coded 3.
X_{21}	Estimated gross family income	Money in Birr received during a month.
X_{22}	Average tutorial hours per- week	Hours a student is provided with tutorial assistance.
X_{23}	Monitoring of activities by parents	Days parental monitoring is provided.
X_{44}	Family's or friend's support	"Satisfactory" coded 1, "Medium" coded 2 and "Unsatisfactory" coded 3.

the students reported that they were not provided with tutorial program. The remaining twenty variables were used in the study. Measurement of each variable was given in variable description (Table 1).

The influence of the selected factors on students' academic achievement was examined by means of *discriminate analysis*, that is, given a student is known to come from one of the two academic achievement groups, high and low, the researcher wants to assign the student to one of these groups on the basis of the study variables associated with the student.

To perform the analysis, SPSS (statistical package for social science) was chosen from the statistical packages because of its stepwise procedures and the amount of statistics it provides. To determine the most important variables, a discriminate analysis was performed using average achievement scores (Y) as the criterion variable and variables which affect the academic achievement as the predictor variables. Since the researcher is concerned with discriminating only two groups, a single canonical discriminate function will be developed to divide the groups.

The derivation stage involves determining whether or not a statistically significant function can be derived to separate the two achievement groups. Among the several discriminate procedures available in the SPSS package, the Mahalanobis procedure, which is based on generalized squared Euclidean distance, was used. This stepwise procedure is designed to develop the best one-variable model, followed by the best two variable model, and so forth, until no other variables meet the desired selection rule. The selection rule in this procedure is to maximize Mahalanobis distance D^2 between groups. The prior's statement is used to set prior probabilities for classification purposes.

There were 41 subjects as low achievers and 59 as high achievers. Since the sample was selected in an unbiased manner, the best estimate of the population proportions is the

sample proportions. By specifying PRIORS = SIZE, the prior probabilities of belonging to low and high achievement groups are .41 and .59, respectively.

The researcher begins his analysis by reviewing the group means and standard deviations to see if the two groups are significantly different on any single variable. Table 2 shows the means and standard derivation for each group of the independent variables, based on 100 subjects.

Table 2: Group Means and Standard Deviations

Variables	Low Achievement Group		High Achievement Group	
	Mean	Std. Dev.	Mean	Std. Dev.
X_1	.341	.480	.864	.345
X_2	16.512	1.690	15.339	1.334
X_3	1.976	1.084	2.424	.875
X_4	3.756	2.119	2.746	1.767
X_5	15.073	5.807	18.847	7.618
X_7	.951	1.396	1.983	1.444
X_8	.683	.471	.695	.464
X_{10}	3.561	3.925	.339	1.124
X_{12}	1.756	.888	2.186	.900
X_{13}	9.610	3.962	11.893	4.574
X_{14}	1.366	.488	1.441	.565
X_{15}	6.902	4.721	9.186	4.584
X_{16}	1.659	.480	1.678	.471
X_{17}	12.049	2.247	13.949	2.161
X_{18}	1.439	.550	1.322	.571
X_{20}	2.756	.538	2.898	.402
X_{21}	456.829	232.674	664.017	275.041
X_{23}	2.537	1.885	2.491	1.995
X_{24}	1.585	.706	1.322	.507

The stepwise procedure begins with all of the variables excluded from the model and selects the single best discriminating variable that maximizes the Mahalanobis distance between the groups. The initial variable is then paired with each of the other independent variables one at a time, and then a second variable is selected. The second variable is the one that is best suited to improve the discriminating power of the function in combination with the first variable. The third and any subsequent variables are selected in a similar manner.

A minimum F value of 1.0 was required for entry. This limitation allowed only variables with F greater than 1. Table 3 below indicates seven variables entered in the model - X_1, X_{10}, X_{17}, X_2, X_5, X_{21}, and X_{14} - and all of them are significant discriminators based on the Wilks' lambda and the minimum D-squared.

Table 3: Summary

Step	Action Entered Removed	Wilks' Lambda	Sig.	Minimum D-squared	Sig.
1	X_1	.70922	.0000	1.66010	.0000
2	X_{10}	.57525	.0000	2.99134	.0000
3	X_{17}	.52076	.0000	3.72818	.0000
4	X_2	.48980	.0000	4.21996	.0000
5	X_5	.48120	.0000	4.36776	.0000
6	X_{21}	.47419	.0000	4.49225	.0000
7	X_{14}	.46877	.0000	4.59112	.0000

Table 4 contains the results for the canonical discriminate function. The function is statistically significant as measured by the chi-square statistic, and displays a canonical correlation of 0.7289. One interprets this correlation by squaring it, that is, $(0.7289)^2$ = .5313 and concluding that 53.13 percent of the variance in a criterion variable (Y) can be explained by this model, which includes only seven predictor variables. At α= 0.01, the critical chi-square value with d.f. = 20 is 37.566.

To test the group differences the statistics based on the eigen function is used. A Wilks' lambda value of .469 associated with chi-square (chi-square = 37.566, d.f. = 20, p < 0.01) indicated that the difference between low and high achievement groups is highly significant.

Table 4: Canonical Discriminant Function

Function	Eigenvalue	Canonical Corr.	Chiquare
1	1/1333	.7289	

The loadings are reported under the heading "Structure Matrix" in Table 5. They measure the simple linear correlation between each predictor variable and the discriminate function. In recent years, loadings are considered somewhat more valid than weights because weights may be split due to predictor interrelations and do not reflect common variance (Hair et al., 1987). Due to their validity, discriminant loadings procedure was used in this analysis. As shown in Table 5, they are ordered from top to bottom (X1, X10, X17, X21, X2, X5, and X14) by the size of correlation within a function. X1 (0.601) has the largest influence while the other variables have influence in the order of the correlation.

Table 5: Structure Matrix (Discriminant loadings)

Variables	Fun.1
X_1	.601
X_{10}	-.56698
X_{17}	.40381
X_{21}	.37394
X_2	-.36757
X_5	.25397
X_{14}	.06527

he validation stage involves developing a classification matrix to evaluate further the predictive accuracy of the discriminate function.   The chi-square test indicated that the function discriminates significantly, but it does not tell us how well the function predicts.   To determine the predictive ability of a discriminate function, the researcher must construct a classification matrix. Before developing a classification matrix, the assumptions of multivariate normality and equal covariance matrices must be assessed and the linear discriminate function coefficients must be obtained.

The linear discriminate function is best for classification if the assumptions of multivariate normality and equal covariance matrices hold true. There is evidence, however, that discriminate analysis is not very sensitive to violations of these assumptions unless the violations are extreme (Harris, 1975). In this study, however, both assumptions hold.

Table 6 shows the classification function coefficients. A set of coefficients is obtained for each group and a student is assigned to the group for which he or she has the largest discriminate score.

Table 6: Linear Classification Function Coefficients

Variable	0	1
X_1	1.38	4.56
X_2	7.84	7.33
X_5	.40	.46
X_{10}	.32	-.04
X_{14}	-1.02	-.39
X_{17}	2.61	2.91
X_{21}	.003	.01
Constant	-85.20	-84.70

Using the above classification criteria, the computer program developed a classification matrix for the students who were included in the development of the discriminate function (analysis sample), as well as those in the control sample which are shown in Table 7. The entries in the diagonal of the matrix represent the number of students correctly assigned to their groups. The off diagonal numbers represent the incorrect classifications. The overall percentage of students correctly classified by the discriminate function for the analysis sample is 87.00%, whereas for the control sample it is 79.00%. The 87.00 % accuracy for the analysis sample is higher than the 79.00 % accuracy for the control sample. This demonstrates the upward bias in not using a control sample to validate the discriminate function and reveals the degree to which the discriminate function classified the students.

Table 7: Classification Matrix for Analysis Sample and Holdout Sample

Actual Group	No. of Cases	Predicted Group Membership 0	1
Group 0	41	34(82.9%)	7(17.1%)
Group 1	59	6(10.2%)	53(89.8%)

Percent of "grouped" cases correctly classified: 87.00%.

Classification results for cases not selected for use in the Analysis

Actual Group	No. of Cases	Predicted Group Membership 0	1
Group 0	10	8(80.0%)	2(20.0%)
Group 1	14	3(21.4%)	11(78.6%)

Percent of "grouped" cases correctly classified: 79.00%

Although the percentages correctly classified are high, to evaluate the effectiveness of the model completely, the researcher can again compare these percentages with the maximum chance and proportional chance criteria.

Determining the chance classification based on the sample size of the largest group is referred to as the maximum chance criterion (C_{max}) (Hair, et al., 1987). The proportional chance criterion (C_{pro}) is calculated by squaring the proportions of each group (Hair, et al., 1987). The maximum chance and proportional chance criteria are shown in Table 8.

Table 8 Calculation of Chance Criteria

Maximum chance criterion

Group 0: (10+41)/124 = 41 percent
Group 1: (14+59)/124 = 59 percent
$\quad\quad C_{max} \quad\quad$ = 0.59 or 59 percent

Proportional Chance Criterion
$\quad\quad\quad C_{pro} \quad\quad$ = $(.41)^2 + (.59)^2$
$\quad\quad\quad\quad\quad\quad\quad\quad$ = .5162 or 51.62 percent

Since C_{max} is greater than C_{pro}, the maximum chance criterion is better than the other one. The percentage correctly classified (79 percent) exceeds the C_{max} criterion substantially, so the researcher can again conclude that the discriminate model is valid.

Because it was found out that the discriminate function was statistically significant and the classification accuracy acceptable, the researcher should continue with the step that involves determining the predictor variables which contribute the most to discriminate the groups. The predictor variables were screened by the stepwise procedure, and only seven of these, namely: X1, X2, X5, X10, X14, X17, and X21 were significant enough to be

included in the function. From Table 5 the researcher can use the information on the discriminate loadings and determine the ranking of these variables in terms of their discriminatory value. Signs do not affect the rankings; they indicate a positive or negative relationship with a criterion variable. The table indicates that sex has the highest correlation with the discriminate function, however the number of days absent from school due to health problem has the second largest correlation in absolute value.

Discussion and Conclusion

In this study, an attempt has been made to investigate factors that affect academic achievements of students at Bole Senior Secondary School. Examining the extent to which the variables discriminate among high and low academic achievement groups and selecting the most important variables in terms of discriminating between the two groups of students were among the main objectives. The variables which contributed most in discriminating between the groups were screened by the stepwise procedure, and only seven were significant enough to be included in the function. Using the discriminate loading interpretation approach, these variables were listed in the order of contribution to the function as follows:

X_1 Sex
X_{10} Number of days absent from school due to
            health problem
X_{17} Closest relative's schooling
X_{21} Estimated gross family income
X_2 Age
X_5 Length of study time

From the above listing "sex" had the largest influence while "number of days absent from school due to health problem" had the second largest influence in determining the function. Among the variables, "age" and "number of days absent from school due to health problem" negatively affected achievements.

Referring back to Table 2, the researcher noted that the mean for high achievers on variables "sex" was higher than those for low achievers. This suggests that the proportion of females in low achievement groups is high. This may indicate that females spend more time helping parents at home than doing homework and assignments, which negatively affects their achievement. The table also shows that the mean age for low achievers is high. This may imply that the older students think more about their independence from parental control and future life than their schooling, or they drop out or repeat classes due to lack of money. Similarly the more days students are absent from school due to health problems, the more likely they are to be low achievers. The study also indicated that the higher the estimated gross family income and the longer the study time, the better was the students' achievement.

The study in general establishes that factors related to students and family background significantly affect the achievement of students. These findings are consistent with the findings of other researchers in this area to-date (Maslow, 1954; Chopra, 1967; Miner, 1968; Dougherty, 1981; Nettles, Thoeny and Gosman 1986; Cohn and Rossmiller, 1987). But the parental involvement factor, that is, monitoring of activities by parents and family's financial and moral support, has no significance, which seems to contradict the findings of other researchers in this area (Fehrman, Keith and Reimers, 1987). One of the parental involvement variables, that is, number of hours a student was provided with tutorial assistance, which was expected to be significant, was not examined further because 91% of the students reported that they were not provided with a tutorial program.

It is recommended, therefore, that

- the academic and administrative staff of Bole Senior Secondary School should arrange counseling programs in the area of selected variables, so that students would be well oriented and encouraged in their study. They should especially encourage greater female student participation.

- future studies be made to investigate and find out whether the present findings apply for other schools as well.

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