A STUDY ON FACTORS AFFECTING ACADEMIC ACHIEVEMENT OF STUDENTS AT BOLE SENIOR SECONDARY SCHOOL

BY

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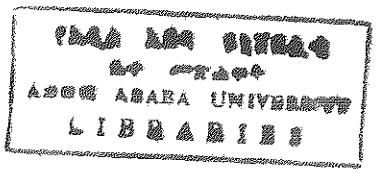

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GOD GIVES WISDOM, KNOWLEDGE
AND
HAPPINESS TO THOSE WHO PLEASE HIM; ....
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ABSTRACT

This study was designed to find out the most important variables that affect the academic achievements of students at Bole Senior Secondary School. The sample consisted of one hundred and twenty four students of which twenty four were assigned to the holdout sample and the remaining one hundred were used as the analysis sample. χ^2 *tests and discriminant analysis were used to analyze the data. The results of* χ^2 *tests indicated that nine of the twenty variables significantly affect the achievements of students. Due to the presence of significant correlations among the variables seven of the twenty variables which affect the achievements of students significantly were selected by using stepwise discriminant analysis. The combined effect of the seven variables on achievement was summarized in one canonical discriminant function and the function was effective in classifying 79% of the holdout sample correctly. Among the selected variables, "sex" has the largest influence in determining the function. Based on the results, some conclusions are made.*

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CHAPTER ONE

1. INTRODUCTION

1.1 Statement of the Problem

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 and Dougherty, 1981). Other studies, however, demonstrated that 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; Miner, 1968; Nettles, Thoeny and Gosman 1986; Keith and Reimers, 1987; Cohn and Rossmiller, 1987).

There are also some inconsistencies in the results obtained from different studies. Wiseman (1964) indicated that the inconsistencies in the results may arise from regional differences. According to Wiseman, since sampling is so difficult and regional differences are too 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 more developed countries like the U.S.A. and Britain. Therefore, it might be interesting to examine the impact of different types of variables on

the academic achievements of students in the high schools in a developing country like Ethiopia.

1.2 Objectives of the Study

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

1. to study the effect of some variables that may influence the academic achievements of students.
2. to examine the extent to which the variables discriminate between high and low achievers and
3. to find out the most important variables which can be used in discriminating the two groups of students.

1.3 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.

1.4 Limitations

Investigating factors that affect academic achievements of students present some inherent difficulties. As in many other complex applied problems, the goal of research on this topic is to single out variables which largely influence the achievements of students. However, in the process of conducting this study work, we have faced certain limitations. It is important, therefore, to carefully note particular limitations of this study.

First, the study is limited to one school in examining factors that affect the academic achievements of students at high school level. Due to time constraints financial problem and shortage or absence of required materials the study covers only two grades of Bole Senior Secondary School.

Second, the variable used as a criterion (Y) is 1994/95 first semester average score of the students obtained from the record office of the school. Whether or not this is a suitable criterion of success, and whether or not it remains equally so for all different grade level is yet unproven. Placing sole emphasis on average score is questionable since there may be sharply varying grading standards in different grade levels.

Third, the academic achievements of students can be affected by several in-school and out-of-school factors. However, it was not possible to include all questions that are related to in-school and out-of-school factors for it makes the questionnaire extremely bulky and result in boredom on the part of the respondents.

Fourth, data analysis needed computers. Nevertheless, due to lack of computer facility in Statistics Department of Addis Ababa University, further analysis of data was hampered.

1.5 Operational Definition of Terms

1. **Academic achievements**: This variable was the mean of all grades earned by each student in the first semester 1994/95 academic year.

2. **Parental Involvement**: This factor refers to the availability and quality of the help and encouragement parents and relatives provide to the student for his or her schoolwork.

3. **Family background**: This factor refers to variables that can be defined as relatively fixed, such as parents and relatives occupation, educational level and their income.

4. **Analysis Sample**: When constructing classification, the original sample was divided randomly into two groups, one for developing the discriminant function and the other for validating it. The group used to compute the discriminant function is referred to as the analysis sample.

5. **Hold-out Sample**: Also referred to as the validation sample. It is the group of students held out of the total sample when the function is computed.

6. **Classification Matrix**: Also referred to as prediction matrix. It is a matrix containing numbers that reveal the predictive ability of the discriminant function.

1.6 Organization of the Study

Chapter two deals with the related literature. That is, it summarizes some of the past findings with regard to predicting the academic achievement of students.

The third chapter discusses procedures, methods of study and preliminary analysis. In this part subjects in the study and variables included in the study are defined. How the data are gathered, their sources and results of preliminary analysis are indicated.

The fourth chapter is concerned with the discussion of factors affecting students' academic achievement. In this part the way the canonical discriminant function is derived and its validation are discussed. The interpretation of discriminant analysis is given.

The fifth chapter presents a discussion of the results and outlines some recommendations.

CHAPTER TWO

2. 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 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.

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 is 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 has a positive relationship with

economic background. His study involved 433 Class 10 science students from high school in Lucknow, India and the study showed that 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.

Miner's (1968) study revealed that four sociological variables, that is, general categories of social class, family structure, sibling structure, and religion affect the academic achievement of students.

Taylor (1969) examined the influence of a tutorial program on 31 tutored and 31 non-tutored freshman engineering students. A t-test analysis showed that the tutorial program benefited students who attended the program fairly regularly.

School achievement of adolescent children with working and non-working mothers was studied by Nelson (1969). 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.

The importance of secondary school preparation for the success of students in college is confirmed by Nettles, Thoeny and Gosman (1986). They reported that students

with good study habits in secondary school, score higher grades when they join colleges. Similarly Summerskill (1965) indicated that secondary school grades are the best predictors of college performance. That is, if a student does not have a good academic preparation in his high school, his grades in college will likely to be lower.

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 affects their grades in their high school study. According to the study, high school students would get high scores, if parents encourage them, monitor their daily activities and school progress and give 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 may be in a better position to raise his level of academic achievement if he lives in a place where encouragement and support are provided for his study.

Jaquess (1987) studied effects 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.

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 exert 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, do not seem to have much more effect on educational attainment of students than the family background factors. According to the review, family background factors are considered as the most important factors that exert strong influence on the academic achievement of students.

Another research report conducted mainly by World Bank staff, has indicated that schools are important factors than family background (Cohn and Rossmiller, 1987). Their review indicated that schools do make a difference in how well and how much students learn, and the academic achievement of students is strongly related to the characteristics of learning environment.

Ademe and G/Meskel (1989) conducted a study to determine the relationship that may exist between students' class activity and their academic achievement in Mathematics based on selected section of the Tana Haik Comprehensive Secondary School in Bahir Dar. Using chi-square and Z-tests they found that no significant difference existed in the proportion of passes (those scoring fifty percent and above) between the active and

passive students. 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 same school 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 tackle most of the problems when framed in the "work out" format. The researchers suggested that while lower order skills such as simple computation and recall of facts may be measured by the objective type of tests, problem solving and the ability to think logically should be measured by the subjective type of tests in which students will be made to show their ability to work out mathematical problems. Their study indicated that lack of essential skills in problem solving leads to hatred that many people develop about Mathematics.

Several studies have been conducted on students academic performance at Addis Ababa University. The studies were mainly focused on the predictive validity of Ethiopian School Leaving Certificate Examination (E.S.L.C.E.) results and on factors that significantly affect the performance of University students.

Mekonnen (1987) applied ranking and selection procedures to study the educational performance of group of students who were admitted to the University in 1982. Results revealed that students who took E.S.L.C.E. once performed better than those who took it twice or more times. Besides, E.S.L.C.E. Mathematics grade was a better predictor of success in the Faculty of Science.

Habte (1988) studied effects of E.S.L.C.E. GPA and some factors on academic performance of first year regular Science degree students. It was implied that, a transform of first semester GPA appears to have strong linear relationship with an identical transform of E.S.L.C.E. GPA. It was also implied that dormitory facilities had a positive effect on students performance.

Mohammmed (1989) studied the academic profiles of 1985 Statistics degree graduates who came from Addis Ababa and other regions of the country. He concluded that the performance trends are similar for the two groups. However, the hypothesis of equal response means was rejected.

The influence of different types of secondary schooling on the academic achievement of students in higher education was studied by Takele (1990). He analyzed the data of the government and non-government secondary school graduates on the E.S.L.C.E. and college GPA. The results appeared to indicate that the influence of government and non-government schools do not bring any difference on students performance at college level in Ethiopia. The results also indicated that E.S.L.C.E. GPA does not predict the academic performance of students at college level except in some institutions of higher learning (namely, Gondar College of Medical Science and Medical Faculty of Addis Ababa University).

Fentaw (1991) studied the influence of Pre-University and University variables on the academic performance of students at Addis Ababa University. He made preliminary

analysis to examine the effect of each variable on students performance using univariate tests, and observed that not many variables significantly influence the academic performance of students. He assessed the combined effect of variables in classifying students to three academic performance groups, and observed that the classification procedure based on variables was effective in classifying students to their respective academic performance groups. In addition, he compared the first three years academic achievement, and indicated that students from different types of academic performance groups had similar trend in academic achievements.

From the reviews of related literature, we have seen that, different factors exert great influence on the students attitude towards learning and affect the achievements of students. Unfortunately, reports of research concerning the factors that influence the academic achievements of students at high school level 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 level.

CHAPTER THREE

3. PROCEDURES, METHODS OF STUDY AND PRELIMINARY ANALYSIS

3.1. PROCEDURES

3.1.1 The Sample

The study population consists of students in grade 9 & 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 were placed as high achievers and others who scored less than or equal to 45 were classified as low achievers. A total of 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. It was decided to use 19 per cent holdout sample. Of the 124 observations, 24 were assigned to the holdout 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 discriminant function if the students used in developing the classification matrix are the same as those used in computing the function.

3.1.2. Data Collection and Instruments to be Used

The questionnaire shown in Appendix I, was designed and used to get the necessary information on the students attitudinal, educational, economic and social backgrounds. Previous related research pieces and publications have helped us in selecting the items of the questionnaire. In order to ensure better 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 enumerator and the students responded on their own copies. They were encouraged to request clarifications on any questions they had trouble in understanding. Both morning and afternoon administrations were done by teachers.

3.1.3 Variables included in the study

The questionnaire was used to get information about:

1. **Personal characteristics, background and effort of each student factor**:- This factor includes variables like sex, age, type of school attended, distance from home, length of study time, efforts made on home works 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.

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

3. **Parental involvement factor**:- This includes variables, such as monitoring of activities by parents, family's or relatives financial and moral support and support through 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 3.1 below and coded values of each variable under the measurements were used in chi-square tests.

Table 3.1 Variables Description

Variable designation	Definition	Measurements
X_1	Sex	Dummies with male Coded 1 and female coded 0.
X_2	Age	In completed years. "≤ 16 years old" coded 1 and "≥ 17 years old" coded 2.
X_3	Types of School attended	"Government" coded 1, "Mission" Coded 2, "Private" Coded 3 and "others" coded 4.
X_4	Distance from home	By the number of kilometers away from school. "0-2" coded 1, "3-4" coded 2 and "≥ 5" coded 3.
X_5	Length of Study time per week	By the number of study hours. "0-14" coded 1, "15-21" coded 2 and "≥ 22" coded 3.
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	By the number of hours students spent in the library. "0" coded 1, "1-4" coded 2 and "≥ 5" coded 3.
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	By the number of days absent from school. "0" coded 1 "1-10" coded 2 and "≥ 11" coded 3.
X_{11}	Getting adequate meals	Dummies with "yes" coded 1 and "No" coded 0.

Variable designation	Definition	Measurements
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	By the number of years of schooling. "0-6" coded 1, "7-13" coded 2 and "≥ 14" coded 3.
X_{14}	Father's Occupation	"Government employees" coded 1, "private business" coded 2 and "Jobless" coded 3.
X_{15}	Mother's schooling	By the number of years of schooling. "0-6" coded 1, "7-13" coded 2 and "≥ 14" coded 3.
X_{16}	Mother's occupation	"Government employees" coded 1, "private business" coded 2 and "jobless" coded 3.
X_{17}	Closest relative's schooling	By the number of years of schooling." "0-6" coded 1, "7-13" coded 2 and "≥ 14" coded 3.
X_{18}	Closest relative's occupation	"Government employees" coded 1, "Private business" coded 2 and "Jobless" coded 3.
X_{19}	Closest friend's schooling	By the number of years of schooling. "0-6" coded 1, "7-13" coded 2 and "≥ 14" coded 3.
X_{20}	Closest friend's occupation	"Government employees" coded 1, "private business" coded 2 and "Job less" coded 3.
X_{21}	Estimated gross family income	By the amount of money in Birr received during a month. "≤ 200" coded 1, "201-600" coded 2 and "≥ 601" coded 3
X_{22}	Average tutorial hours per-week	By the number of hours student is provided with tutorial assistance. "0" coded 1, "1-5" coded 2 and "≥ 6" coded 3.
X_{23}	Monitoring of activities by parents	By the number of days parental monitoring is provided. "0" coded 1, "1-4" coded 2 and "≥ 5" coded 3.
X_{24}	Family's or friend's support	"Satisfactory" coded 1, "Medium" coded 2 and "Unsatisfactory" coded 3.

3.2 Methods of Study

The influence of the selected variables on student's academic achievement was examined by means of:

1. **Preliminary analysis**:- Chi-square tests were carried out to determine those variables which are significantly related to academic achievement.

2. **Discriminant analysis**:- Given a student is known to come from one of the two academic achievement groups-high and low- we want to assign the student to one of these groups on the basis of the study variables associated with the student. This section will be presented in detail in chapter four.

To perform the analysis, SPSS was chosen from the statistical packages, because of its stepwise procedures, the amount of statistics it provides, and the wider range of discriminant procedures it allows.

3.3 Preliminary analysis

3.3.1 Grade type and academic achievement

To test the hypothesis, that the two grades are heterogeneous with regard to the academic achievements of students, low and high achieving groups were defined. Table 3.3.1 shows the distribution of students in the two academic achievement groups. High percentage of students in both grades are from high achievement groups. The chi-square test (χ^2= 0.305, d.f. =1) indicated that the two grades are identical in the academic achievement of students. Therefore, the effect of each variable is investigated for both grades of low and high achievement groups jointly.

Table 3.3.1 Grades and Academic Achievement

Group	9th (58)	11th (42)
Low	24(41.4%)	17(40.5%)
High	34(58.6%)	25(59.5%)

3.3.2 Study Variables and Academic Achievement

The data shown in Appendix II were subjected to chi-Square tests to determine which, if any, of the variables under study were significantly related to academic achievement of students. Because the responses of almost all the students were found to be identical, four of twenty four variables were not examined further and the remaining twenty variables were used in the study. Measurement of each variable was given in variable description (Table 3.1). Table 3.3.2 shows the D.F., χ^2 values P-values and significant χ^2 - values which were indicated by asterisk (*).

Table 3.3.2 Variables in Table and Academic Achievement

Variables	D.F.	χ^2 - Value	P-Value
X_1	1	29.078	.000*
X_2	1	7.646	.006*
X_3	3	13.871	.003*
X_4	2	4.571	.102
X_5	2	5.698	.058
X_7	2	12.796	.002*
X_8	1	.016	.899
X_9	1	.311	.577
X_{10}	2	26.165	.000*
X_{12}	3	8.385	.039*
X_{13}	2	17.613	.000*
X_{14}	2	1.459	.482
X_{15}	2	2.539	.281
X_{16}	2	.041	.839
X_{17}	2	14.018	.001*
X_{18}	2	3.574	.167
X_{20}	2	4.403	.111
X_{21}	2	17.521	.000*
X_{23}	2	3.573	.168
X_{24}	2	5.630	.060

*P < .05, N = 100

As Table 3.3.2. indicates, from the twenty variables used in the study, nine variables are significantly related with the academic achievement of students. These

variables are as follows: sex, age, type of school attended, time spent in the library, number of days absent from school due to health problem, how spare time is spent, father's schooling, closest relatives schooling and estimated gross family income.

Frequency distribution of variables which were not examined further was shown in the following Table. Measurement of each variable was given in variable description (Table 3.1).

Table 3.3.3 Frequency Distribution of Students by X_6, X_{11}, X_{19}, and X_{22}

Variables	Value label	Frequency	Percent
X_6	0	5	5
	1	95	95
X_{11}	0	5	5
	1	95	95
X_{19}	1	3	3
	2	95	95
	3	2	2
X_{22}	1	91	91
	2	4	4
	3	5	5

As Table 3.3.3 indicates, 95% of the students reported that they made efforts on home works, were provided with adequate meals, and friend's schooling was of their grade level, respectively. 91% of the students reported that they were not provided with tutorial program.

3.3.3 The Sample correlation

In the previous section, we have seen that a number of individual variables significantly affected the academic achievement of students. Significantly correlated variables which were tested at $p < .01$ level are indicated by asterisk (*) in Table 3.3.4. Due to the presence of significant correlations not only individual variables but also different combinations of these variables may significantly affect the academic achievement of students.

In the next chapter, the combined effect of all variables on achievement will be examined by means of discriminant analysis.

Table 3.3.4 The Sample Correlation Matrix

Variable	X1	X2	X3	X4	X5	X7	X8	X9	X10	X12	X13	X14	X15	X16	X17	X19	X20	X21	X23	X24
X1	1																			
X2	-.163	1																		
X3	-.201	-.107	1																	
X4	-.180	.226	-.427*	1																
X5	.013	-.192	.098	-.146	1															
X7	.165	-.367*	.214	-.412*	.247*	1														
X8	-.036	.047	-.076	-.050	.053	.029	1													
X9	-.114	-.016	.161	-.077	-.088	.029	.131	1												
X10	-.311*	-.270*	-.152	.089	-.247*	-.199	.121	.016	1											
X12	.238*	-.110	.288*	-.193	.081	.181	-.106	.112	-.228	1										
X13	.092	-.192	.320*	-.238*	.220	.209	.189	-.073	-.339*	.362*	1									
X14	-.086	.183	.118	-.024	-.064	-.106	-.012	.152	-.075	.074	-.135	1								
X15	.057	-.050	.220	-.126	.201	.157	.146	-.077	-.128	.202	.556*	-.067	1							
X16	.065	.068	-.045	-.034	.062	.079	-.103	-.135	-.052	-.062	-.171	.021	-.520*	1						
X17	.238*	-.126	.189	-.307*	.056	.256*	.131	.009	-.211	.236*	.339*	.250*	.145	.126	1					
X18	-.189	.041	.112	-.134	.055	.101	-.021	.014	.052	.052	.008	.095	.062	-.144	-.367*	1				
X20	.154	-.256*	.019	-.125	.171	.236*	.095	-.074	-.022	.004	.054	-.181	.070	-.013	.015	.036	1			
X21	.288*	-.220	.317*	-.130	.151	.276*	.106	-.027	-.217	.272*	.694	-.119	.551*	-.308*	.238*	-.126	.111	1		
X23	-.191	.008	.001	-.136	.143	.032	.030	.124	.046	.122	-.036	-.015	.002	-.113	.043	.028	.109	-.073	1	
X24	-.033	.311*	-.343*	-.242*	-.064	-.141	-.096	-.102	.189	-.280*	-.170	-.207	-.026	-.064	-.301*	.151	-.076	-.151	-.209	1

CHAPTER FOUR

4. FACTORS AFFECTING ACADEMIC ACHIEVEMENT

The objective of this analysis is to determine variables which are most important in discriminating low and high achievers. To determine the most important variables, a discriminant analysis was performed using average achievement scores (Y) as a criterion variable and variables which affect the academic achievement as the predictor variables. Since we have been concerned with discriminating only two groups, a single canonical discriminant function will be developed to divide the groups.

4.1 Derivation of Canonical Discriminant Function

The derivation stage involves determining whether or not a statistically significant function can be derived to separate the two achievement groups. Among the several discriminant 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 priors 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.

We begin our analysis by reviewing the group means and standard deviations to see if the two groups are significantly different on any single variable. Table 4.1 shows the two groups means and Std. Dev. for each of the independent variables, based on 100 subjects.

Table 4.1 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_6	.902	.300	.983	.130
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

Table 4.2 shows the univariate analysis of variance used in testing the means of the individual variables between the groups. Since variables were considered

individually, lambda is the ratio of the within-groups sum of squares to the total sum of squares. Small values of lambda indicate that group means do appear to be different. That is, a minimum value of Wilks' lambda corresponds to a maximum F-value. Calculated F-statistics which are significant at 0.05 level are indicated by asterisk (*). Thirteen of the 20 variables vary significantly between the two groups. But the probability levels for the univariate F-ratios ignore the interdependence of the predictors.

Table 4.2 Test for Equality of Group Means

Wilks' Lambda and Univariate F-ratio with 1 and 98 degrees of Freedom

Variable	Wilks' Lambda	F	Significance
X_1	.70922	40.18	.000*
X_2	.86722	15.00	.0002*
X_3	.94953	5.209	.0246*
X_4	.93594	6.708	.0111*
X_5	.93189	7.163	.0087*
X_7	.88535	12.69	.0006*
X_8	.99684	.016	.8998
X_9	.99689	.306	.5817
X_{10}	.73297	35.70	.0000*
X_{12}	.94602	5.592	.0200*
X_{13}	.93562	6.744	.0109*
X_{14}	.99520	.473	.4932
X_{15}	.94358	5.859	.0173*
X_{16}	.99959	.040	.8409
X_{17}	.84403	18.11	.0000*
X_{18}	.98943	1.047	.3086
X_{20}	.97718	2.288	.1336
X_{21}	.86321	15.53	.0002*
X_{23}	.99987	.013	.9098
X_{24}	.95406	4.719	.0322*

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 a second variable is selected. The second variable is the one that is best able 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 in Table 4.2 to be considered for entry into the initial model. Table 4.3 below indicates seven variables entered 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. By comparing these results with the univariate results, shown in Table 4.2, one can see that it is not always possible to predict from univariate results, variables which will be included in a discriminant function.

Table 4.3 Summary Table

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 4.4 contains the results for the canonical discriminant function. The function is statistically significant as measured by the chi-square statistic, and displays a canonical correlation of .7289. One interprets this correlation by squaring it $(0.7289)^2$ = .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 $\alpha = 0.01$, the critical chi-square value with d.f. = 20 is 37.566.

Table 4.4 Canonical Discriminant Function

Function	Eigenvalue	Canonical corr	Chi-square
1	1.1333	.7289	71.60

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.

The standardized canonical discriminant function coefficients are shown in Table 4.5 below. X_1(.602) has the largest influence in determining the function. All other variables are associated with smaller weights.

Table 4.5 Standardized Canonical Discriminant Function Coefficients

	Func 1
X_1	.60174
X_2	-.35073
X_5	.19165
X_{10}	-.44753
X_{14}	.15619
X_{17}	.30831
X_{21}	.19265

The loadings are reported under the heading "Structure Matrix" in Table 4.6. They are ordered from top to bottom by the size of correlation with-in function. They will be discussed later under the interpretation phase.

Table 4.6 Structure Matrix

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

The average scores for the groups or the group centroids can be interpreted as the number of standard deviations each group is away from the average of both groups (Hand,1981). They are indicated in Table 4.7 below. The average value for low achievement group (group 0) is -1.26419, while that of high achievement group (group 1) is .87850.

Table 4.7 Discriminant Function Centroids

Group	Fun1
0	-1.26419
1	.87850

4.2 Validation of Canonical Discriminant Function

The validation stage involves developing a classification matrix to evaluate further the predictive accuracy of the discriminant 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 discriminant function, we 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 discriminant function coefficients must be obtained.

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

The assumption of multivariate normality for low and high achievers was assessed using normal probability (p-p) plot. The plots shown in Appendix III, resemble a straight line along the diagonal through the origin. This suggests that there is no serious departure from the normality assumption.

The equality of covariance matrix is confirmed by using Box's M-test, which is based on the determinants of the group covariance matrices. As shown in Table 4.8, the significance probability is based on an F-transformation. A small probability might lead us to reject the null hypothesis that the covariance matrices are equal. However, when sample sizes in the groups are large, the test is not sensitive to the violation of the assumption.

Table 4.8 Test of Equality of Group Covariance Matrices Using Box's M.

The ranks and natural logarithms of determinants printed are those of the group covariance matrices.

Group Label	Rank	Log Determinant	
0	7	16.391	
1	7	13.645	
Pooled Within-Groups Covariance Matrix	7	16.00	
Box's M.	Approximate F	Degree of freedom	Sig.
121.38	3.9888	28, 25853.2	.0000

Table 4.9 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 has the largest discriminant score.

Table 4.9 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 classification matrix for the students who were included in the development of the discriminant function (analysis sample), as well as those in holdout sample which were shown in Table 4.10. The entries on the diagonal of the matrix represent the number of students correctly assigned to their groups. The numbers off the diagonal represent the incorrect classifications. The overall percentage of students correctly classified by the discriminant function for the analysis sample is 87.00%, whereas for the holdout sample is 79.00%. The 87.00 percent accuracy for the analysis sample is higher than the 79.00 percent accuracy for the holdout sample. This demonstrates the upward bias in not using a holdout sample to validate the discriminant function and reveals how well the discriminant function classified the students.

Table 4.10 Classification Matrix for Analysis Sample and Holdout Sample

Classification Results for Cases Selected for Use in the Analysis.

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

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

Classification results for cases not selected for use in the Analysis.

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

Percent of "grouped" cases correctly classified: 79.00%

Both of the percentages correctly classified are high. But to evaluate the effectiveness of the model completely, we can again compare these percentages to 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 4.11.

Table 4.11 Calculation of Chance Criteria

Maximum chance criterion

Group 0: (10+41)/124 = 41 percent

Group 1: (14+59)/124 = 59 percent

C_{max} = 59 percent

Proportional Chance Criterion

$C_{pro} = (.41)^2 + (.59)^2$

$= .5162$ or 51.62 percent

Since C_{max} is greater than C_{pro}, the maximum chance criterion is the criterion to outperform. The percentage correctly classified (79 percent) exceeds the C_{max} criterion substantially, so we again conclude that the discriminant model is valid.

4.3 Interpretation of Discriminant Analysis

We have seen that the discriminant function is statistically significant and classification accuracy is acceptable. Now, we should continue to part three. This part involves determining the predictor variables that contribute the most to discriminate the groups. The predictor variables were screened by the stepwise procedure, and only seven were significant enough to be included in the function - X_1, X_2, X_5, X_{10}, X_{14}, X_{17} and X_{21}. The selected variables correctly classified whose holdout sample constitutes 79.00%

indicate that using additional variables other than these ones does not improve classification.

Recall that Table 4.5 and 4.6 contain the discriminant weights and loadings for the function respectively. Discriminant loadings, referred to sometimes as structure correlations, measure the simple linear correlation between each predictor variable and discriminant function. In recent years, loadings are considered somewhat more valid than weights because weights may be split due to predictor intercorrelations and do not reflect common variance (Hair et al.,1987).

From Table 4.6 we can use the information on the discriminant 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 (SPSS-X,1986).

The Table indicates that sex has the highest correlation with the discriminant function. Number of days absent from school due to health problem has the second largest correlation in absolute value.

The results of this chapter demonstrate the usefulness of applying discriminant analysis for correlated variables. Based on these results, some conclusions are made in the next chapter.

CHAPTER FIVE

5. 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 questionnaire was designed and used to get the necessary information on the attitudinal, educational and social backgrounds of the students. The average scores of both Ninth and Eleventh grade students were recorded from school's record office and students were identified as high and low achievers on the basis of the average scores.

The chi-square test indicated that the academic achievements of students in both grades were homogeneous. Due to the homogeneity of achievements, the effect of all variables was investigated for both grades jointly.

From the twenty four variables used in the study four variables were not examined further because the responses of almost all the students were found to be identical. Of the twenty variables, nine were found to significantly affect the achievements of students when subjected to the preliminary analysis (chi-square tests).

These were: sex, age, type of school attended, time spent in library, days absent from school due to health problem, how spare time is spent, father's schooling, closest relatives schooling and estimated gross family income.

As Table 3.3.4 shows, the sample correlation matrix suggested the existence of a significant relationship between the variables. Due to the presence of significant correlations not only individual variables but also different combinations of these variables seem to have an effect on the students' achievements. The combined effect of all variables was examined by means of discriminant analysis. A stepwise discriminant analysis was conducted to determine the most important discriminating variables between the two groups. The effect of all variables on achievements was summarized in one canonical discriminant function and the chi-square test indicated that the function discriminates significantly.

The variables which contribute 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 discriminant loadings interpretation approach, these variables were listed in 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

X_{14} Father's occupation

The predictive ability of a discriminant function was determined by constructing the classification matrix. The linear discriminant function was effective in classifying 79% of the holdout sample correctly using the above seven variables. This indicates that additional variables other than the selected ones did not significantly improve the classification. The effectiveness of the model was further evaluated by using maximum chance and proportional chance criteria and concluded that the function was effective in classifying students as low and high achievement groups.

From the above listing "sex" has the largest influence while "number of days absent from school due to health problem" has 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 4.1, we note that the mean for high achievers on variable "sex" is higher than those for low achievers. This suggests that the proportion of females in low achievement groups is high. This may indicate that females help parents at home much of their time than doing homeworks and assignments which later affect 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 todays learning.

From our study, 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. But the parental involvement factor has no significance, which contradicts the findings of other researchers in this area.

It is recommended, therefore, that

1. the academic and administrative staff of Bole Senior Secondary School should arrange counselling program in the area of selected variables, so that students will be well oriented and encouraged in their study.

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

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APPENDIX I

Academic Achievement Survey of Students at Bole Senior Secondary School.

1. Sex: Male ☐ Female ☐

2. Age (in completed years) _____

3. Type of school attended before joining senior secondary school.

   Public ☐

   Mission ☐

   Government ☐

   Others, please specify _____

4. What is the distance of school from your home?

   _____ kilometers.

5. On the average, how many hours do you study per week?

   _____ hours per week.

6. Do you regularly complete homeworks and assignments on time?

   Yes ☐ No ☐

7. 1. Do you read books related to your subjects in the library?

   Yes ☐ No ☐

   2. If your response to item 7.1 above is yes, how often do you go to the library? _____

8. Do you borrow books from the library or friends for reading?

   Yes ☐ No ☐

9. Do you regularly study with your friends or classmates?

   Yes ☐ No ☐

10. 1. Do you have any health problem?

Yes ☐ No ☐

2. If your response to item 10.1 above is yes, how many days were you absent from school this semester due to health problem?

_____ days.

11. Do you regularly get adequate meals?

Yes ☐ No ☐

12. How do you spend your spare time?

_____

_____

_____

13. Educational attainment of your father _____

14. Occupation of your father _____

15. Educational attainment of your mother _____

16. Occupation of your mother _____

17. Educational attainment of your closest relative _____

18. Occupation of your closest relative _____

19. Educational attainment of your closest friend _____

20. Occupation of your closest friend _____

21. What is your family's approximate gross monthly income? _____ Birr per month.

22. 1. Do your parents supplement your regular high-school lesson by hiring private tutors?

Yes ☐ No ☐

2. If your response to item 22.1. above is yes, on the average, how many hours per week are you being tutored?

_____ hours per week.

23. 1. Do your parents monitor your daily activities and school progress?

Yes ☐ No ☐

2. If your response to item 23.1 above is yes, how often do they monitor your daily activities and school progress? _____

24. How do you rate the degree of support (financial, moral, etc.) from your family's or close friends?

1. Satisfactory
2. Medium
3. Unsatisfactory

Appendix II: Original Data

No.	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23	X24	Y
1.	1	14	1	2	40	1	1	1	0	0	1	2	16	1	14	1	14	1	9	3	682	0	0	1	85
2.	1	13	3	1	28	1	3	0	0	0	1	3	16	1	12	2	23	1	9	3	980	0	2	2	82
3.	1	15	3	1	9	1	4	1	0	0	1	3	12	2	6	2	14	1	10	3	800	0	0	1	92
4.	1	18	1	5	12	1	0	0	0	0	1	1	12	1	0	2	12	1	12	3	500	0	0	1	65
5.	1	15	3	1	21	1	3	1	1	0	1	3	14	1	13	2	16	1	9	3	980	0	2	1	84
6.	1	15	3	3	21	1	3	1	0	0	1	2	16	1	14	1	12	2	11	3	1200	0	2	1	86
7.	1	15	1	3	16	1	4	0	0	0	1	3	8	2	6	2	16	1	9	3	700	0	2	1	80
8.	1	14	3	1	21	1	3	0	0	0	1	3	9	1	7	2	14	1	9	3	450	0	5	1	88
9.	1	15	3	1	21	1	2	0	0	0	1	3	16	1	16	1	12	3	10	3	1200	0	2	2	84
10.	1	15	1	5	15	1	0	0	0	0	1	2	2	2	5	2	13	1	10	3	300	0	0	2	82
11.	1	14	1	1	14	1	2	1	0	0	0	1	14	1	4	2	14	1	9	3	950	0	0	2	86
12.	1	14	3	2	17	1	3	1	0	0	1	1	13	1	13	1	13	1	9	3	980	0	5	1	84
13.	1	15	3	1	14	1	4	1	0	0	1	3	16	1	12	1	16	1	9	3	1200	0	5	2	89
14.	1	14	1	5	15	1	0	1	0	0	1	1	14	1	14	1	14	1	10	3	700	0	2	2	90
15.	1	16	1	6	22	1	0	1	0	1	1	3	16	1	16	1	14	1	8	3	1200	0	5	2	90
16.	1	16	3	3	35	1	3	0	0	0	1	1	11	2	10	2	14	1	9	3	675	0	5	1	65
17.	0	15	3	3	21	1	0	1	0	0	1	1	14	1	10	2	16	1	12	2	650	0	1	1	65
18.	1	14	3	1	14	1	2	1	1	0	1	2	16	2	13	1	16	1	9	3	800	0	2	1	90
19.	1	14	3	3	19	1	2	0	0	0	1	3	14	1	14	2	14	1	9	3	650	0	5	1	80
20.	1	13	3	1	28	1	3	0	0	0	1	3	16	1	4	2	16	1	9	3	750	0	3	1	65
21.	0	14	3	2	21	1	5	1	1	0	1	3	16	1	14	1	16	1	9	3	750	0	3	1	86
22.	0	14	1	4	22	1	2	0	0	5	1	1	1	1	5	1	12	1	9	3	350	0	5	1	65
23.	1	14	3	1	16	1	2	0	0	0	1	3	14	1	12	2	12	2	9	3	700	0	5	1	91
24.	1	14	3	2	40	1	5	1	0	0	1	1	14	1	11	2	16	1	9	3	630	0	0	1	91
25.	1	14	3	1	25	1	2	1	0	0	1	3	16	1	14	1	12	2	9	3	980	6	0	1	83
26.	1	14	3	1	14	1	3	1	0	0	1	3	14	1	14	1	10	2	9	3	700	0	3	1	91
27.	1	14	3	1	14	1	2	1	0	0	1	1	7	2	12	2	16	1	9	3	500	0	2	1	66

28.	1	14	3	2	15	1	1	1	1	0	1	3	14	2	12	1	13	2	9	3	650	0	5	1	65
29.	1	16	3	1	7	1	1	1	0	0	1	3	8	1	6	2	14	1	12	3	500	0	0	1	91
30.	1	14	3	2	21	1	1	1	0	0	1	3	14	1	12	1	13	2	9	3	650	0	5	1	89
31.	1	15	1	3	21	1	1	1	0	0	1	3	3	2	0	2	14	1	9	3	150	0	1	1	71
32.	0	17	3	3	14	1	0	0	0	5	1	1	8	2	1	2	14	1	12	2	250	0	2	2	72
33.	1	15	1	3	14	1	2	1	0	0	1	3	14	1	14	2	14	1	9	3	700	0	5	1	87
34.	1	13	3	4	14	1	2	1	1	0	1	2	17	2	13	2	16	1	9	3	980	0	1	1	81
35.	0	15	3	3	14	1	0	0	1	5	1	1	5	1	8	1	12	2	9	3	500	0	5	1	43
36.	0	15	1	7	14	1	1	0	0	6	1	1	13	1	14	1	6	2	10	3	750	0	0	3	42
37.	0	14	3	4	21	1	1	1	0	4	1	2	14	2	14	1	14	2	6	3	500	7	1	1	42
38.	0	17	3	2	21	1	1	1	0	2	1	1	16	2	5	2	10	3	9	3	750	0	1	1	34
39.	0	16	3	5	14	1	0	1	0	0	1	4	10	1	8	1	12	2	9	3	300	2	2	2	43
40.	0	21	4	2	14	1	0	1	0	5	1	3	14	2	12	2	16	2	9	3	500	0	2	1	37
41.	0	16	1	3	21	0	0	1	0	10	1	1	7	1	1	2	12	1	9	3	230	0	1	3	39
42.	1	17	3	4	14	0	2	1	0	10	0	1	5	1	3	2	9	1	8	3	240	0	1	2	43
43.	1	17	1	2	6	1	0	1	1	8	1	2	6	1	5	1	12	2	10	3	250	0	1	2	39
44.	1	16	4	3	7	1	0	0	1	9	1	2	6	1	0	2	12	1	10	3	500	0	2	1	39
45.	1	15	4	1	20	1	0	0	0	0	1	4	8	1	0	2	12	2	9	3	380	0	1	1	42
46.	1	15	1	6	14	1	0	1	0	0	1	2	6	1	0	2	6	1	9	3	400	0	5	1	43
47.	0	15	3	3	18	1	2	1	0	5	1	2	13	1	10	2	12	2	10	3	400	0	5	1	40
48.	0	17	1	3	7	1	0	1	0	3	1	1	5	2	0	2	12	1	9	3	100	0	2	1	37
49.	1	16	2	6	14	1	0	1	0	3	1	1	6	1	6	2	9	1	8	2	400	0	1	1	38
50.	0	14	1	2	14	1	5	0	0	10	1	3	10	1	0	2	12	2	10	3	250	0	5	1	40
51.	1	16	1	2	7	1	0	0	0	8	1	1	6	1	0	2	12	1	9	3	250	0	2	2	39
52.	1	16	1	6	28	1	0	1	0	0	0	1	8	1	4	2	12	1	9	3	250	0	0	3	40
53.	0	17	1	5	7	1	0	0	0	3	1	1	0	2	5	1	12	1	9	3	200	0	5	2	39
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55.	0	16	3	5	15	1	0	1	0	8	1	2	12	2	12	1	12	2	12	2	650	2	2	1	44
56.	0	15	1	4	14	1	2	1	0	0	1	1	13	1	10	2	13	1	9	3	420	0	1	2	36
57.	0	18	1	10	7	1	0	1	0	11	1	1	12	1	6	2	12	2	9	3	500	0	2	2	36
58.	0	14	1	3	14	1	0	0	0	0	1	1	7	2	8	1	14	1	8	3	400	0	5	1	40
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60.	1	16	3	5	7	1	0	1	0	0	1	2	6	1	6	2	10	1	12	3	450	0	2	2	65

61.	1	15	3	4	14	1	2	1	0	0	1	2	16	1	13	1	14	1	12	3	900	0	5	1	85
62.	1	16	3	2	16	1	3	1	0	0	1	1	9	1	8	2	12	1	12	3	400	0	1	1	72
63.	1	17	3	1	10	1	0	0	0	0	1	2	14	1	1	2	12	1	14	1	420	6	0	2	73
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65.	0	16	3	4	21	1	2	1	0	0	1	1	7	1	4	2	10	3	12	3	300	0	5	2	78
66.	1	16	3	1	28	1	1	0	0	0	1	2	12	2	12	2	12	1	11	3	700	0	1	1	65
67.	0	17	3	1	30	1	0	1	0	0	1	1	14	1	12	2	13	2	11	3	450	0	5	1	69
68.	0	18	3	1	28	1	3	1	0	2	1	3	16	2	14	2	16	1	11	3	700	0	2	1	72
69.	1	15	1	9	12	0	0	1	0	0	1	2	0	2	0	2	12	2	10	3	100	0	0	1	65
70.	1	15	1	5	14	1	2	0	0	0	1	2	12	1	4	2	12	1	6	3	300	0	0	1	65
71.	1	17	3	2	14	1	3	0	0	0	1	2	0	3	12	1	12	3	11	3	400	5	2	2	75
72.	1	17	1	2	20	1	0	0	0	0	1	1	4	2	4	2	14	2	11	3	200	0	2	2	75
73.	1	16	3	2	12	1	4	0	1	0	1	1	12	1	9	1	19	1	11	3	700	0	1	2	74
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76.	0	16	1	5	21	1	0	1	1	0	1	3	16	2	12	1	12	2	11	3	670	0	2	2	71
77.	1	16	1	4	20	1	5	1	0	0	1	2	12	1	6	2	14	2	11	3	600	6	0	2	76
78.	1	16	1	5	30	1	2	1	0	0	1	1	6	2	4	2	8	2	8	2	500	0	0	1	85
79.	1	16	3	2	21	1	2	1	0	0	1	4	14	2	8	2	14	1	11	3	650	0	5	1	71
80	1	18	2	4	12	1	0	1	0	0	1	2	14	1	13	1	16	1	12	3	800	0	5	1	67
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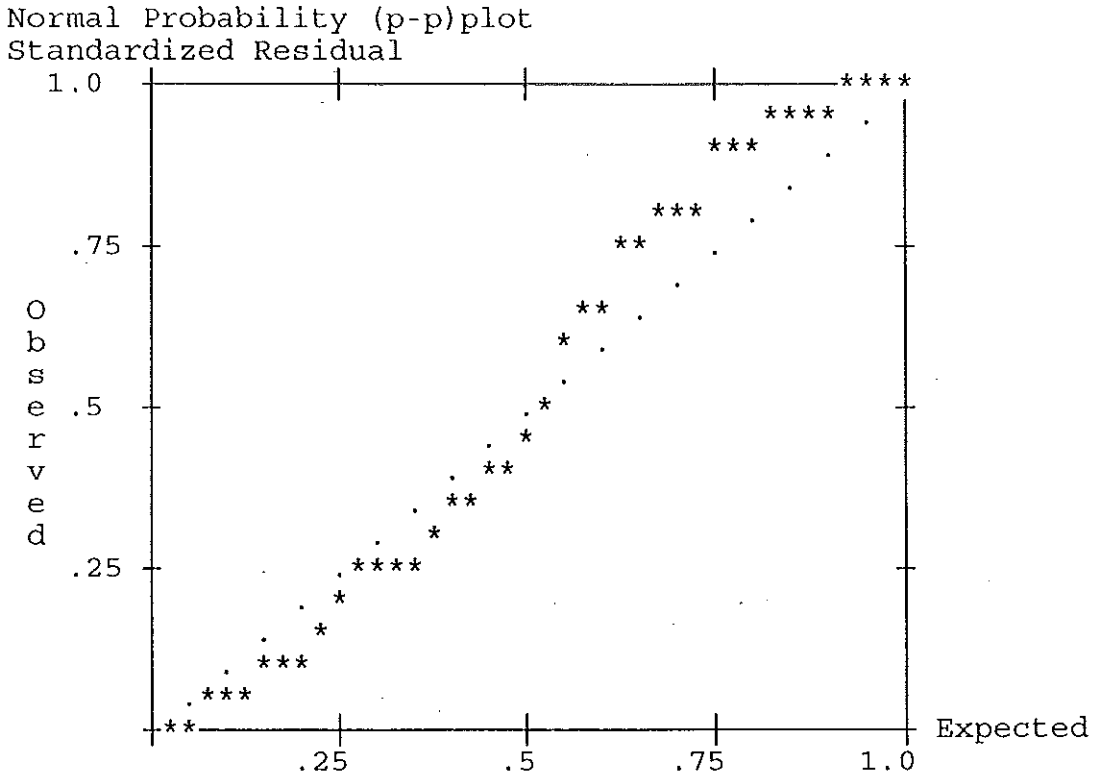
88.	0	16	1	2	6	1	3	0	0	0	1	3	12	1	6	2	14	1	11	3	400	0	5	1	43
89.	0	17	3	4	10	1	0	1	1	0	0	1	6	2	5	2	12	1	8	2	300	0	1	1	41
90.	1	16	3	2	14	0	2	1	0	0	1	2	14	1	12	2	14	1	11	3	750	0	0	2	42
91.	1	22	1	5	14	1	0	0	0	5	1	3	12	1	14	1	12	1	12	1	750	0	2	3	29
92.	0	17	1	5	20	1	2	1	0	0	1	2	12	2	10	1	8	1	12	2	900	0	1	1	42

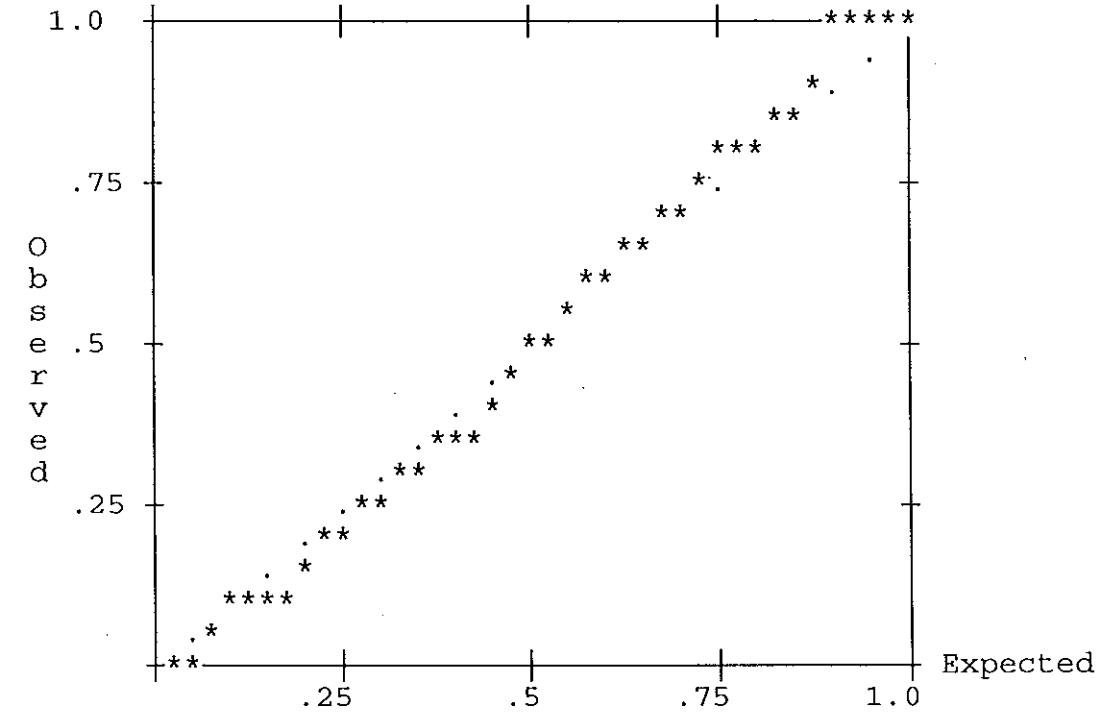
93.	1	20	2	10	21	0	1	0	0	0	1	2	12	1	8	2	9	2	11	3	500	0	1	3	38
94.	0	18	1	4	14	1	0	1	0	5	0	1	15	1	14	1	12	1	11	3	1000	0	2	2	36
95.	0	17	1	3	22	1	0	1	0	0	1	1	12	1	7	2	11	1	10	3	160	0	5	2	41
96.	0	17	2	2	20	1	5	0	1	3	1	1	0	2	0	2	12	2	11	3	200	0	5	2	38
97.	0	16	1	3	21	1	3	1	0	0	1	1	12	1	11	2	12	2	11	3	800	7	0	2	45
98.	1	18	3	1	14	1	3	1	0	11	1	1	6	2	7	1	14	1	12	3	400	0	1	2	32
99.	0	15	1	4	21	1	1	1	0	0	1	1	6	1	6	2	14	1	8	2	250	0	5	1	39
100.	0	17	3	4	18	1	0	1	1	0	1	3	14	2	12	1	13	1	6	2	600	0	2	1	45
101.	0	15	1	7	14	1	1	0	0	6	1	1	13	1	14	1	6	2	10	3	650	0	0	3	44
102.	0	16	3	5	14	1	0	1	0	0	1	4	10	1	8	1	12	2	9	3	300	2	2	2	36
103.	0	16	1	3	21	0	0	1	0	10	1	1	7	1	1	2	12	1	9	3	200	0	1	3	42
104.	1	16	4	3	7	1	0	0	1	9	1	2	6	1	0	2	12	1	10	3	400	0	2	1	41
105.	0	15	3	3	18	1	2	1	0	5	1	2	13	1	1	2	12	2	10	3	350	0	5	1	38
106.	0	14	1	2	14	1	5	0	0	10	1	3	10	1	0	2	12	2	10	3	300	0	5	1	40
107.	0	15	1	4	14	1	0	0	0	10	1	2	10	1	8	2	14	1	9	3	500	4	2	1	42
108.	0	18	1	10	7	1	0	1	0	11	1	1	12	1	6	2	12	2	9	3	600	0	2	2	38
109.	0	14	1	3	14	1	0	0	0	0	1	1	7	2	8	1	14	1	8	3	400	0	5	1	43
110.	0	17	3	6	20	1	2	1	1	0	1	2	12	1	6	2	12	1	11	3	350	0	5	2	44
111.	1	15	3	1	9	1	4	1	0	0	1	3	12	2	6	2	14	1	10	3	750	0	0	1	93
112.	1	15	3	1	21	1	3	1	1	0	1	3	14	1	13	2	16	1	9	3	980	0	2	1	86
113.	1	15	1	3	16	1	4	0	0	0	1	3	8	2	6	2	16	1	9	3	600	0	2	1	82
114.	1	14	3	3	19	1	2	0	0	0	1	3	14	1	14	2	14	1	9	3	650	0	5	1	84
115.	0	14	1	4	22	1	2	0	0	5	1	1	1	1	5	1	12	1	9	3	400	0	5	1	66
116.	1	14	3	1	25	1	2	1	0	0	1	3	3	2	0	2	14	1	9	3	900	6	0	1	84
117.	1	15	1	3	21	1	1	1	0	0	1	3	3	2	0	2	14	1	9	3	200	0	1	1	72
118.	0	17	3	3	14	1	0	0	0	5	1	1	8	2	1	2	14	1	12	2	250	0	2	2	74
119.	0	16	3	4	21	1	2	1	0	0	1	1	7	1	4	2	10	3	12	3	300	0	5	2	76
120.	1	17	3	2	14	1	3	0	0	0	1	2	0	3	12	1	12	3	11	3	250	0	0	1	66
121.	1	16	3	2	12	1	4	1	1	0	1	1	12	1	9	1	19	1	11	3	600	0	1	2	75
122.	1	16	1	4	20	1	5	1	0	0	1	2	12	1	6	2	14	2	11	3	500	6	0	2	74
123.	1	18	2	4	12	1	0	1	0	0	1	2	14	1	13	1	16	1	12	3	700	0	5	1	65
124.	1	17	2	5	14	1	0	0	0	0	1	1	16	2	6	2	14	1	11	3	900	0	0	1	71

Appendix III: Normal Probability Plot

LOW ACHIEVERS



HIGH ACHIEVERS



A STUDY ON FACTORS AFFECTING ACADEMIC ACHIEVEMENT OF STUDENTS AT BOLE SENIOR SECONDARY SCHOOL

BY

MATHEWOS TAMIRU

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the School of Graduate Studies,
Addis Ababa University in (Part) Fulfillment
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Addis Ababa,
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