**Science Journal of Education**
2014; 2(4): 131-136
Published online September 20, 2014 (http://www.sciencepublishinggroup.com/j/sjedu)
doi: 10.11648/j.sjedu.20140204.15
ISSN: 2329-0900 (Print); ISSN: 2329-0897 (Online)

# Analysis of the determinants of academic achievement of primary education: A case study on grade eight students at Lay Gayint Wereda in Amhara regional state

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## To cite this article:

Yibeltal Arega, Tewodros Getinet, Hailemariam Abebe. Analysis of the Determinants of Academic Achievement of Primary Education: A Case Study on Grade Eight Students at Lay Gayint Wereda in Amhara Regional State. *Science Journal of Education.* Vol. 2, No. 4, 2014, pp. 131-136. doi: 10.11648/j.sjedu.20140204.15

**Abstract:** Background: Ethiopia is one of the countries which placed education at the center of its strategies for development and democratization, with strong policies promoting quality of educational provision and rapid expansion of educational opportunity to previously underserved populations (AUC, 2005; TGE, 1994). Objective: The core objective behind this study is to identify key factors affecting output indicator of primary education quality at Lay Gayint Woreda in South Gondar zone. That is to identify factors which affect output indicator of quality of primary education, the determinant indicators on outcome variable, to select the most important variables that are related to output indicator of quality of primary education in Lay Gayint Woreda. Methods: In this study multiple linear regression model, factor analysis or principal component analysis was used. Conclusion: This study used regression analysis and factor/ principal component analysis and the following results were obtained. From the selected variables the most significance factors are counseling office, job satisfaction of teachers, way of monitoring and evaluation, school leadership and library service, sex, work load at home, time taken to arrive in the school and preschool attendance, schools input and leadership factors and teachers activity have a significance effect on the school output. The variables supportive books at home, head of house hold educational level, house hold size, age of the student, number of students in class, teachers academic qualification, exam condition, laboratory service, availability duplicating machine, toilet and water service in school had not significance effect on the output of schools.

**Keywords:** Principal Component Analysis (PCA), Regression Analysis

## 1. Introduction

Education is the total process in developing human ability and behavior. According to UNESCO, education is an organized and sustained instruction designed to communicate a combination of knowledge, skill and understanding valuable for all the activities of life. In all aspects of the school and its surrounding education community, the rights of all children, to survival, protection, development and participation are at the center. This means that the focus is on learning which strengthens the capacities of children to act progressively on their own behalf through the acquisition of relevant knowledge, useful skills and appropriate attitudes; and which creates for children, and helps them create for themselves and others, places of safety, security and healthy interaction (Deresse et al., 1999).

Educational quality now crucial in developing countries has become a topic of intense interest, primarily because of countries' efforts to maintain quality in the context of quantitative expansion of educational provision. Many countries are simultaneously implementing reforms based on more active approaches to teaching and learning, further challenging education systems and, especially, teachers. Within this context, three issues frame much of the present discussion of education quality: (i) exploring the meaning of educational quality in particular country contexts; (ii) locating the engines of quality in complex processes at the school, classroom, and community levels; and (iii) recognizing and strengthening the key role of teachers in promoting quality (USAID/EQUIP1, 2006).

Ethiopia is one of those countries which has placed

education at the center of its strategies for development and democratization, with strong policies promoting quality of educational provision and rapid expansion of educational opportunity to previously underserved populations (AUC, 2005; Transitional Government of Ethiopia, 1994). For instance, Ethiopia's rapidly expanding gross enrollment rates (GERs), 20 percent in the early 1990to nearly 80 percent in 2004/2005, indicate that Ethiopia has made great effort in increasing the quantity of education available, although gender imbalances remain a serious problem (Ministry of Education 2005a). The gross enrolment rate for grades 1-8 in Amhara regional state for 2004/2005 was 78.9 percent, almost the same as the national average. In Amhara regional state there are major gaps between boys and girls; GER for boys in grades 1-8 is 91.7 percent and for girls it is 66.0 percent (Moumie Maoulidi and MCI, 2009).

# 2. Methodology

### *2.1. Study Population*

This study has covered the target population of all grade 8 students who took elementary school leaving examination in 20011 /2012 in Lay Gayint Woreda, Amhara regional governmental state. The reason of choosing this level was that, the student took the uniform examination across all schools.

### *2.2. Sample Size Determination*

The study was conducted at Lay Gayint woreda in South Gondar zone in Amhara region. This study covered all students who were took elementary school leaving examination in 2011. Under this study systematic sampling was adopted. There were 3048 students who took elementary school leaving examination in 2011 in this Wereda. The next was determining the sample size that represents the total population with the following formula:

$$n_0 = \frac{Z^2_{\alpha/2} S^2}{d^2} = 214$$

Where $S^2$ is the variance for the score of student which obtained from the pilot study and it was 0.25 and d was the acceptance absolute error and it was 0.067 and the significance level was α= 5 %. Therefore

$$n = \frac{n_0}{1 + \frac{n_0}{N}} = \frac{214}{1 + \frac{214}{3048}} = 200$$

Generally the sample size was 200 and questionnaires were distributed to those students randomly.

# 3. Results and Discussions

### *3.1. Descriptive Statistics*

The Millennium Development Goals (MDG's) declaration states that all children (boys and girls) should be able to complete primary school by the year 2015. Sub-Saharan countries are far from achieving the goal of universal primary completion and rural population and girls are less likely to attend school in these regions (United Nations, 2006: 6). The Ethiopian context does not differ a lot from other developing countries. Under this chapter we have described the findings of this research by using different type of statistical methods.

As shown in the following table and figure, most of the students (around 51.5 %) have work load at home and about 80.5 % of the student have no preschool attendance. Most of the schools have their own library service (57 %) and counseling office (52.5 %).

***Table 1.*** *Summary of descriptive statistics*

| No | Variables | Response in percent | |
|---|---|---|---|
| | | Yes | No |
| 1 | Work load of the student | 51.5 | 48.5 |
| 2 | Preschool attendance | 17.5 | 80.5 |
| 3 | Counseling office | 52.5 | 47 |
| 4 | Library service | 57 | 43 |

In addition to the above tabular presentation we can also represent it through bar chart as follows even if the discretion is the same.

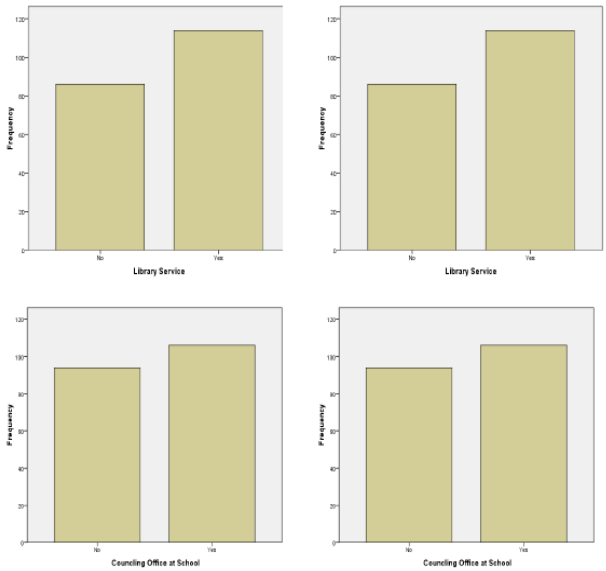


***Figure 1.*** *Bar chart of workload at home, preschool attendance, counseling office and library service.*

### *3.2. Multiple Linear Regression Result*

#### *3.2.1. Multiple Linear Regression Result of Student Level Variable*

The regression model used in the empirical work follows the relationship between the school output (student score at elementary school leaving examination) with school level and student level variables. Student level variables are variables that determined the mark of the student at the student level by itself. It includes the variables like

supportive books at home, head of house hold educational level, sex, house hold size, pre school attendance, time taken to arrive to the school, age, and work load at home. The SPSS output told us the overall regression is significant because of the P value (0.000) is less than the level of significance 5% and the coefficient of determination is $R^2$=0.732 implies 73.2 % of the variation in mark of the student is expressed by the variation in the independent variables i.e. supportive books at home, head of house hold educational level, sex, house hold size, pre school attendance, time taken to arrive in the school, age, and work load at Home. The remaining 1-$R^2$ is unexplained part or about 26.8 % of the variation in the dependent variables (mark of the student) is unexplained due to the absence of others variables.

To give more impression to this statistical result, let us give more extra discussion on our significant variables with related to the experience of other countries. Holmes (2003: 249-264) examined the determinants of school completion in Pakistan. In this study the variable age, parental education and income of the household were found to have a positive impact on education. And In Papua New Guinea, Gibson (2005: 1 – 19) studied the barriers to education, and he found that the enrolment depends on the age, the household income, the parental education and the distance from schools. Other variables that are determinants for children's education, although with less weight, were the size of the household, demographic characteristics and headship of the household and in this study we got also the same experiences like others.

The output in table 2 told us the variables sex, work load at home, time taken to arrive in the school and pre school attendance have a significant effect on the score of student (because the corresponding p values are less than the level of significance 5%. The coefficient of sex was -6.65 it shows that the mark of the student had improvement when the student sex is shift from female to male. The coefficient of workload and arrival time is -19.68 and -0.088 respectively. When the work load of student is much, students can't do their home work at the right time, they don't have extra time for studying and so on. Due to this it has inverse relationship with the mark of student.

If the arrival time is increased by one unit, at the reveres the score of the student is decreased by 0.088 unit assuming other factors are constant. If the home location of the student is far from the school, the students may lose more time to arrive in their own school. Consequently, students become tired and hence they couldn't attend the class attentively even if they arrived at school on time. Therefore the students are tired in class and they cannot attend their class attentively. Similarly when we move from the non-overloaded to over loaded students, their mark is decreased by 19.68 and preschool attendance has a coefficient 5.138 (i.e. student had preschool attendance; automatically it had positive influence on the score of the student).

Beyond the above variables, we don't considered the other like supportive books at home, head of house hold educational level, house hold size, age because these variables are insignificant

***Table 2.*** *Coefficient of student level variables*

| Variables | Coefficients | Sig. |
|---|---|---|
| (Constant) | 80.837 | 0.00 |
| Sex of Students | -6.653 | 0.00 |
| Age of Students | 0.104 | 0.91 |
| House Hold Size | -0.919 | 0.11 |
| Head of house hold educational level | -5.538 | 0.30 |
| Work load at home | -19.682 | 0.00 |
| Time Taken to arrive in the school | -0.088 | 0.00 |
| Preschool attendance | 5.138 | 0.04 |
| Supportive Books at Home | -2.353 | 0.157 |

### *3.2.2. Regression Result of School Level Variables*

School level variables are variables that influence the mark of the student in the school not at the student level by itself. It includes the variables like number of students in a class, student counseling office, teacher's academic qualification, job satisfaction of teachers, exam condition, ways of monitoring and evaluation of the student, level of school leadership, laboratory, library, duplicating machine, toilet and water service in a school. The p-value of the regression model was 0.00 meaning the overall regression model is highly significance. The $R^2$ is 0.713 that is 71.3 % of the variation in mark of the student is expressed by the variation in the independent variables i.e. number of students in a class, counseling office, teachers academic qualification, job satisfaction of teachers, exam condition, ways of monitoring and evaluation, level of school leadership, laboratory, library, duplicating machine, toilet and water Service in a school. The remaining 1-$R^2$ is unexplained part or about 28.7% of the variation in the dependent variables (mark of the student) is unexplained due to un inclusion of others variables.

From table 3, we recognize that the variable of student counseling office, job satisfaction of teachers, way of monitoring and evaluation, school leader ship and library service have contribution to the score of student. Both of these variables are affect the score of student positively or have direct relationship between the score of student with the stated variables. If there is a counseling office in a school, students have the chance to get different advices on different types of issues. Due to this the mark of student shows some improvement due to the availability of counseling office.

***Table 3.*** *Coefficient of school level variables*

| Variables | Coefficients | sig. |
|---|---|---|
| (Constant) | 26.75 | 0.001 |
| Counseling office | 7.944 | 0.000 |
| Job satisfaction of teachers | 4.845 | 0.022 |
| Way of monitoring and evaluation | 8.497 | .000 |
| School leadership | 2.900 | .002 |
| Library | 14.941 | .001 |

The school leadership has a great role in the teaching learning process through increasing different types of

school facilities. Generally if the school leadership is strong, automatically students attend their class properly, teachers doing their responsibility at the right time. Due to this reason school leader ship affect the mark of student positively. Job satisfaction of teachers is the intensive activities of teachers in their schools as well as in the class room. Sometimes the teachers are discomfort with their profession due to different factors. Different literatures express their discomfort related to payment, work load and so on. Here we don't discuss the factors that affect job dissatisfaction of teachers but we illustrate this concept with the school output or the mark of the student. Job satisfaction of teachers play major role in the score of students as well as the quality of education. The coefficient of this variable is positive; this positive coefficient indicates the direct relationship between score of the student and job satisfaction of teachers.

In different schools different types of monitoring and evaluation is employed. It may be continuous assessment or not. In this research the statistical output shows that if the school applies continuous assessment method, automatically the student score shows an improvement. When we come to library service in schools, all schools have not their own libraries. The availability of library service has the positive impact on the score of student. Again here we don't considered the other variables like number of students in a class, teachers' academic qualification, exam condition, laboratory, duplicating machine, toilet and water Service in a school because of these variables are once insignificance.

### *3.3. Output of Principal Components Analysis*

Orthogonal factors were obtained using varimax rotation. This eliminated problems of multicollinearity. Only those factors with an eigenvalue greater than 1 and high Cronbach's α coefficients are considered. Cronbach's α is the most common form of internal consistency reliability coefficient based on the average inter-item correlation. A factor loading of .45 has been used to screen out variables that are weak indicator components of business success. The composite reliabilities of the factors were checked against the Nunnally's recommended standards (Cronbachα≥.7) mainly to ensure that they are reliable indicators of the constructs (Nunnally, 1978). Reliability is the correlation of an item, scale, or instrument with a hypothetical one which truly measures what it is supposed.

In varimax rotation factor solution for the original 9 items, 66.41 % of the total variance was explained by the first 2 factors with eigenvalues greater than 1. These factors account for 45.15 % and 21.26 % of the variation. The first factor that is comprised of five items (quality of black board, desks, class room, teachers' office and school leader ship) is the most significant (accounting for 45.15 % of the variance of the original items). This is largely loaded with measure of internal capacity and stability factor items. Four items in the second factor (i.e. ability of teachers in treating students, ability of teachers in doing exercises in class, ability of teachers in giving home and class work and ability of teachers well known the subject matter) accounts 19.26 %of 21.26% of the variance of the original items.

The two outcome determinants are consistent with dimensions that are identified by scree plots. From this analysis, the Cronbach's α was 0.815 which is greater than 0.7 and indicates that the items are adequate scale that means both inter and intra items correlation become high and, consequently, the items coefficient of determination becomes large to explain the variance of the model.

Therefore as we can see from table 4 we obtained two factors namely Schools input and leadership factors (it contains the variable quality of black board, desks, class room and teachers' office and level of school leadership), and Teachers activity factors (it contains the variable ability of teachers in treating students, in doing exercises in class, in giving home & class work and well known the subject matter).

***Table 4.*** *Results of factor analysis using varimax factor rotation*

| Items | Factor 1 | Factor 2 |
|---|---|---|
| Variance accounted for | 45.15% | 21.26 % |
| Eigenvalue | 3.81 | 1.74 |
| • Quality of desk | 0.902 | |
| • Quality of black board | 0.902 | |
| • Level of school leadership | 0.683 | |
| • Quality class room | 0.674 | |
| • Quality teachers office | 0.0.549 | |
| • Ability of teachers in treating students | | 0.869 |
| • Ability of teachers in doing exercises in class, | | 0.780 |
| • Ability of teachers in giving home & class work | | 0.753 |
| • Ability of teachers well known the subject matter | | 0.725 |

Once we got the above two factors, the next task is to asses which factor is more significant on students output or mark of the student by using regression model. And the overall regression model between the marks of the student with the extracted two factors is significant because the corresponding p values are less than the level of significance. The $R^2$ is 0.7013 indicating 70.13 % of the variation of mark of student is expressed by the two extracted factors or factor of school input and leadership and factor of teachers' activity.

In table 5 both the factors school input and leadership and teachers activity are highly significance because their p

value is less than the level of significance. Both the factor of school inputs and leadership and teachers activity influences the score of the student positively. When the school input and leadership is improved, at the same the school output is increased with 12.99 by assuming other factor are constant. We come to the second factor or school input and leadership factor, again this influences the school output positively. If the teacher activity is growing, the school output is improved with 4.4 (assume other factor are constant). The parameters of the extract factor were obtained from the SPSS and looks like as follow:

***Table 5.*** *Coefficient of the extracted factors*

| Variables | Coefficient | Sig. |
|---|---|---|
| Constant | 60.42 | 0.000 |
| Factor of school input and leadership | 12.99 | 0.000 |
| Factor of teachers' activity | 4.49 | 0.000 |

If the school has good black board, office, class room, desk and good school leadership, the teachers as well as the students will be egger in teaching learning process. In general the school output is highly determined by teacher's activity, school input and leadership.

# 4. Conclusions

The goal of achieving universal primary education (UPE) has been on the international agenda since the Universal Declaration of Human Rights affirmed, in 1948, that elementary education was to be made freely and compulsorily available for all children in all nations.

The main objectives of this study are to assess the factors that affect the educational achievements of the student. Under this study different types of variables are listed and assess the impact of listed variables by using different statistical models.

From the descriptive part around 51.5 % have work load at home and about 80.5 % of the student have no preschool attendance. Most of the schools have their own library (57 %) service and counseling office (52.5 %).

From the selected variables the most significance factors are counseling office, job satisfaction of teachers, way of monitoring and evaluation, school leader ship and library service sex, work load at home, time taken to arrive in the school and pre school attendance schools input and leadership factors and teachers activity have a significance effect on the school output.

The variables supportive books at home, head of house hold educational level, house hold size, age of the student, number of students in a class, teachers academic qualification, exam condition, laboratory service, availability duplicating machine, toilet and water Service in a school haven't significance effect on the output of schools.

# Recommendations

Based on the findings of this research work, the output of the school is determined by counseling office, job satisfaction of teachers, way of monitoring and evaluation, school leader ship and library service, sex, work load at home, time taken to arrive in the school and pre school attendance, schools input and leadership factors and teachers activity.

Therefore the government as well as the concerned body should

- Increase the facility of school factors like quality of class rooms, teacher's office, and black board and try to improve the strength of school leadership in school.
- The school leader ship and the government body work together to overcome different types of problems inside the school.
- To minimize the school distance, the government tries to opens school at the right position.
- The school leadership tries to motivate teachers in teaching learning process, open the floor of the class to apply the continuous assessment teaching methodology.

In general, the school leadership, the family and the concerned body should work collaborate to prevail over different types of factor that determine the school output.

# List of Abbreviations

| | |
|---|---|
| AUC | African Union Commission |
| FA | Factor analysis |
| PCA | Principal Component Analysis |
| GERs | Gross Enrollment Rates |
| NOE | National Organization of Examinations |
| NETP | National Education Technology Plan |
| ESDPs | Education Sector Development Programs |
| USAID | United States Agency for international Development |

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