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Constructs Influencing Performance of National Examinations Examinees: The Case of Grade Ten Amhara Regional State Students

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ABSTRACT

Examinations are given to certify and select candidates for higher educations. The Ethiopian General Secondary Education Certificate Examination (EGSECE) was administered for the first time at a national level to students who completed grade 10 by the year 2001. It included 9 exams on academic subjects. From 2001 to 2019 it was the national examinations given to grade ten students. This study was done on grade ten student's results that were taken the EGSECE exams in Amhara region 2001 to 2017. Year to year though the numbers of Ethiopian general secondary education certificate examination exam sitters were increased, the relative numbers of passers were very low. The purpose of the research was to extract the hidden risk factors affecting passers size in the region and measure correlation between passers size and constructs. To analyze the data, we used factor analysis model. The analysis with varimax and promax rotation methods on passers size separated by zonal area revealed two constructs. The correlation between the numbers of national exam passers and latent variables, and the total influences of the constructs in deteriorating passers size in the different zones of the region were very high. Identifying constructs affect student's performance in examinations will help education bureaus and offices, policy makers, planners, teachers and supervisors alleviate their influences in the future, and increase efficiency and quality of the education in the region and in the country.

Keywords: Constructs influencing performance; EGSECE; Factor analysis; National examination examinees; Policy makers

INTRODUCTION

Education is a process that helps to develop the social and economic status of a given society. It is a fundamental instrument in the poverty alleviation process of any country. Education as an essential means for developing human resource and proper utilization of natural resource has becoming critical for social and economic development and poverty reduction. As stated by Ministry of Education (MOE), education helps human beings to change as well as develop and conserve environment for the purpose of all rounded development by diffusing science and modern technology in to the society and also it has great significance to understand and respect democratic and human rights. It is a prerequisite for personal development of an individual and economic development of the Society as well for the country. Examinations are given to certify completion of a program at a satisfactory level of achievement, and select candidates for

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higher education, professional training, and thus, ultimately, for employment. The prospect of the examination affects student's motivation to achieve, influencing the quality of his/her work; the test paper itself legitimizes the school's course of study and shapes what teachers do in the classroom; and the results form part of parents evaluation of their children's schooling. While not always conclusive, examinations have powerful influences on individual's success in adult life. They also serve as a gauge of the quality of a nation's educational efforts and its workforce. Taxpayers and politicians use the results to estimate how well national resources have been spent, to measure the status and relative progress of regional, social, or ethnic group relative to another, and to compare their nation's educational level with that of other nations (**Figure 1**) [1-5].

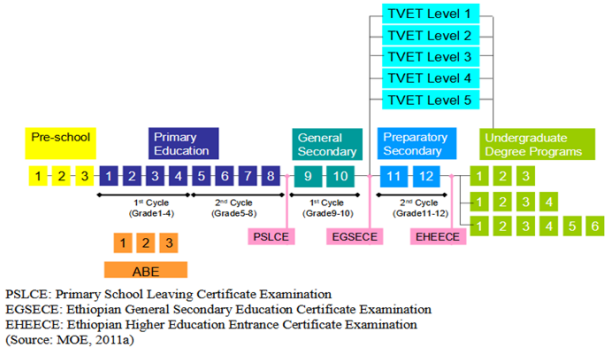

Figure 1: Structure of the Ethiopian education system 1995 to 2019.

As **Figure 1** shows the education structure of Ethiopia was composed of 3 years of pre primary education, 8 years of primary education (1st cycle: Grades 1-4, 2nd cycle: grades 5-8), 2 years of general secondary education (grade 9-10), 2 years of preparatory secondary education, and higher education. School year starts on the 13th of September and ends in the first week of July. The school year is divided into 2 terms with September to January as term I and February to July as term II. Schools are in vacation in January (2 weeks) and in July and August (2 months). From 1998 to 2019 upon completion of grades 8, 10, and 12, students take the education completion certificate examinations and are allowed to proceed to the next stage based on performance in the examinations. The Ethiopian general secondary education certificate examination was administered for the first time at a national level to students who completed grade 10 by the year 2001 on the basis of the new curriculum designed to general secondary education (grades 9 and 10). The general secondary education certificate examination included 9 exams on academic subjects (*i.e.*, Amharic, English, Mathematics, Biology, Chemistry, Physics, Geography, History, and Civics), 4 exams on regional languages (*i.e.*, Tigrigna, Afan Oromo, Harari and Anguak) and 2 others on Geez and French language. This study focusses on the number of grade 10 students sitting for and passing the Ethiopian General Secondary Education Certificate Examination (EGSECE) 10th grade national examination, which was typically administered in May and June of each year. For each of nine subjects in the EGSECE on which students are tested, they are assigned a score ranging from 0.0 to 4.0. To achieve a grade of A or 4.0 for a single subject, for example, a student's raw score (number of questions answered correctly) must be at least two standard deviations above the mean score achieved for all students in that subject. A grade of B or 3.0 would be given to a student whose score in a subject is between one and two standard deviations above the mean. To determine an overall Grade Point Average (GPA), scores in English and mathematics, which are compulsory subjects, plus a student's five highest scores from among the other subjects are added and then divided by seven. That process provides an overall composite score, which also ranges from 0.0 to 4.0. A GPA of 2.0 represents a passing score on the EGSECE (Education, 2015). The EGSECE was thus a norm referenced assessment. Such assessments indicate how a student has performed relative to other students taking the same test but do not indicate whether a student has achieved a particular level of proficiency or competence in the subjects tested. Ethiopia's National Educational Assessment and Examinations Agency (NEAEA) prepared the EGSECE each year. Scores on the examination determine receipt of a grade 10 completion certificates as well as eligibility for advancement to grade 11 and the university track. Even though the numbers of secondary schools and EGSECE exams sitters in Amhara regional state have increased from year to year, the numbers of passers in EGSECE exams were decreased from time to time. As per **Figure 2** shows the promotion rate of the students for both sexes have a decreasing trend. In 2015 from all students taking EGSECE only 34% were got the access to join the upper secondary school. Even there was a school only 3 students got pass mark in their EGSECE exams to join their preparatory program. Since it is difficult to get direct causes from students why they failed in their national exam the researcher tries in investigating the hidden factors that influences the students performance in their national exam results indirectly [6-11].

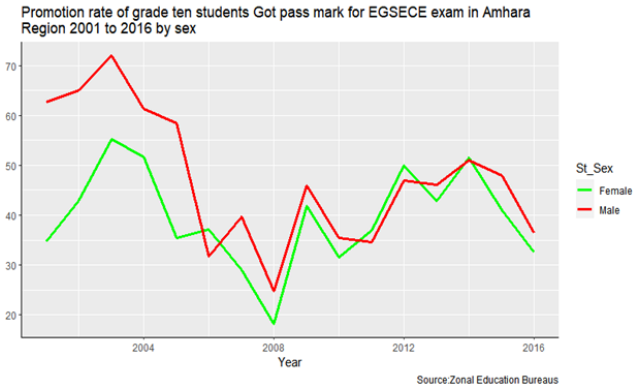

Figure 2: Time series graph of the promotion rate of grade ten students got pass mark for the EGSECE exam in Amhara region 2001 to 2016 by student sex.

As different researchers found in their study there are different factors that deteriorates student results. MOE stated that "the learning environment is determining factor for student's performance and survival at any given

educational level." Odaga and Heneveld argue that the school environment, teachers attitude and pedagogy, and bias in learning materials affect the performance and attainment of students. The instructional materials such as text books, modules, reference books, magazines, new audio visual (plazma) and other equipment are very crucial in facilitations effective learning. Moreover, instructional materials are critical ingredient in learning and the intended curriculum cannot be easily implemented without them. Tekeste has stated the following: In Ethiopia school teachers have no teaching materials designed to assist them and text book which one load to students against payment are always in short supply in most case several students share the text books. Effective teaching is determined by teacher's knowledge of subject matter and mastery of pedagogical skill which creates positive effect on student's academic performance. To show the impotence of qualified teachers, Shibeshi, Frase and Hamman, et al. have indicated the teachers play decisive role in the fulfillment of education goals. Gemeda and Tynjala indicate that if teachers are well qualified, well paid, motivated respected and get opportunity to update his/her knowledge get prepare pedagogically and content wise, then teachers can make a difference in student's academic performance in classrooms and initiated to do things with their own effort. Physical environment in which the formal teaching learning occur ranges relatively from modern and well equipped to open air gathering place. The school infrastructure that significantly affect the student academic performance includes the class rooms, offices, toilet rooms, water supply, electricity services, technology services, computer laboratory, science laboratory, library, staff lounges, attractive green area, swimming pool etc. In Ethiopia, academic freedom has not guaranteed and as in many other countries, governmental power has been used to turn the educational system into an institution that largely serves the interests of state power holders. There was a lack of transparency in academic staffing decisions, with numerous complaints from individuals in the academic community of bias based on party membership. Moreover, in Ethiopia academic freedom is more precarious. Incorporating political interests in school decision making can make the business of school difficult to manage [12-16].

Taking the above background information about EGSECE exam sitters and passers, and the result of different researchers into account this research would attempt to achieve the accompanying objective: Extracting and naming the constructs influencing the EGSECE exam results of Amhara regional state students separated by the different administrative zones, and would try to address the following research questions.

- Are there latent variables that deteriorate the numbers of the national examination passers in the region?
- If there, what are the factors that deteriorate the numbers of the national examination passers in the region?
- Do the factors that deteriorate the numbers of the national examination passers in the region have the same influence across the different administrative zones?
- Is there correlation between the numbers of the national examination passers size and the specific constructs?
- How much is the total influences of the constructs in decreasing the numbers of the national examination passers size in the different administrative zones of the region?

Conceptual Framework

Based on the literature review, students academic performance will be studied by adopting a multiple perspective, which implies investigating the economic, cultural and parental factors that influence the educational outcomes in terms of assessment result in the study area. According to Kavuma, the education of students is affected by different factors such as economic, social, cultural, political, and school factors. Therefore, the factors that affect the academic performance and performances of students can be classified in numerous ways. Some of these factors that affect students education are related to economic, psychological, family related and institutional factors. Thus, the particular research study, the relationship and the influences of the independent variables on the dependent variable will help to analyze the valid results. Hence, the conceptual framework diagram of this study is indicated in **Figure 3**.

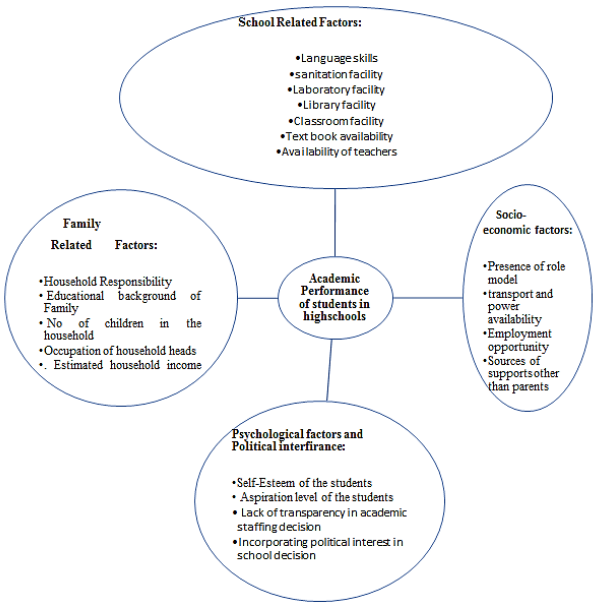

Figure 3: The conceptual framework of factors that affect students performance.

MATERIALS AND METHODS

Data Source

Education administration in Ethiopia is generally controlled by the ministry of education at the federal level and education bureau at the regional levels. In Amhara Region schools are controlled by Woreda education offices; Woreda education offices in turn controlled by zonal education bureaus and zonal education bureaus are controlled by regional education bureau. So, for this research the data were obtained from

zonal and regional education bureaus. In addition, the researcher has got data from Amhara mass media agency (ATV) and Ethiopian Television (ETV) news.

Sampling Design

Based on the nature of the study population in this research, the researcher adopted the multi stage cluster random sampling where the stages were the administrative zones, schools and the students even if the researcher did not consider the school effects. Students were the primary units while their administrative zone where their schools found were the secondary units. All grade ten students registered to take the EGSECE exam in each year in several high schools found in the different administrative zones of the region were the sample.

Research Design

In fact, the research design is the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. As such the design includes an outline of what the researcher will do from writing the hypothesis and its operational implications to the final analysis of data. Since the researcher has not had any intervention anything for subjects and has not made comparison between or among groups, the research design it adopts in this research is descriptive research design.

Method of Data Analysis

For this study to analyze the data the researcher has used the following statistical method.

Exploratory factor analysis: Factor Analysis (FA) was originally developed as a procedure for ''disclosing'' (discovering) unobserved traits or latent traits, typically referred to as factors, which presumably underlie subjects performance on a given set of observed variables and explain their interrelationships. These factors are not directly measurable, but are instead latent or hidden random variables or constructs, with the observed measures being their indicators or manifestations in overt behavior. Statistically, a goal of FA is to explain the manifest (observed) variable interrelationships that is, the pattern of manifest variable interrelations with as a few as possible factors. Thereby, the factors are expected to be substantively interpretable and to explain why certain sets (or subsets) of observed variables are highly correlated among themselves. Last but not least, if needed, one can also provide estimated subject scores for each of these factors, which are akin to the principal component scores and may similarly be used in subsequent statistical analyses. More specifically, the aims of FA can be summarized as follows: (a) To determine if a smaller set of factors can explain the interrelationships among a number of original variables (a similar data reduction concern as in Principal Component Analysis (PCA); (b) To find out the number of these factors; (c) To interpret the factors in subject-matter terms; as well as possibly (d) To evaluate the studied persons on the factors, by providing estimates of their individual factor scores that could be used in subsequent analyses. FA has a long history. In terms of systematic treatments, it is the English psychologist Charles Spearman who is generally credited with having developed it into a form that resembles closely the method used today in the behavioral and social sciences. The strongest impetus for the early development of FA came from psychology, in particular in connection with the study of human intelligence. Charles originally introduced the FA idea in his seminar article ''general intelligence: Objectively determined and measured,'' published in the American journal of psychology [17-18].

Model of factor analysis: A characteristic feature of FA, especially when compared to PCA, is that FA is based on a specific statistical model. Broadly speaking, a statistical model typically consists of (a) A set of equations defining formally the assumed variable relationships, and (b) Associated distributional assumptions concerning involved variables. To define the FA model, let us denote a vector of p observed variables by by $\underline{X}=(X_1,X_2,X_3,\ldots,X_p)$ '

The FA model is then defined as follows:

$$\begin{aligned} X_1 &= \lambda_{11}f_1 + \lambda_{12}f_2 + \cdots + \lambda_{1m}f_m + \varepsilon_1 \\ X_2 &= \lambda_{21}f_1 + \lambda_{22}f_2 + \cdots + \lambda_{2m}f_m + \varepsilon_2 \\ &\vdots \quad\quad \vdots \quad\quad \vdots \quad\quad \cdots \quad\quad \vdots \quad\quad \vdots \\ X_p &= \lambda_{p1}f_1 + \lambda_{p2}f_2 + \cdots + \lambda_{pm}f_m + \varepsilon_p, \end{aligned} \qquad (1)$$

Where $f_1,f_2,\cdots,f_m$ (typically with m<p) are the factors

λ_{ij} are called factor loadings (*viz*. of the i^{th} observed measure on the j^{th} factor); i=1,2,⋯,p and j=1,2,⋯,m

$\varepsilon_1,\varepsilon_2,\cdots,\varepsilon_p$ are the error terms also occasionally called residual terms or alternatively uniqueness terms or uniqueness factors.

The error terms contain both random error of measurement and what is called variable specificity. Variable specificity comprises all sources of variance (other than pure measurement error) in the pertinent observed variable, which do not originate from the factors. Variable specificity is often also referred to as specificity factor. Its variance is the amount of variability in a given manifest variable, which is not shared with the other observed variables in the model and is unrelated to that of random measurement error for this variable.

Equations 1 in the compact form are given by:

$$\underline{\boldsymbol{x}} = \boldsymbol{\Lambda}\underline{\boldsymbol{f}} + \underline{\boldsymbol{\varepsilon}} \qquad (2)$$

Where $\underline{x}$ is the p × 1 vector of observed or manifest variables,

$\Lambda=(\lambda_{ij})$ is the p × m matrix of factor loadings, $\underline{f}$ is the m × 1 vector of factors, and $\underline{\varepsilon}$ is the p × 1 vector of error terms assumed unrelated among themselves and with the factors in $\underline{f}$, as well as with zero mean.

Assumption of factor analysis model: In addition to its equations in equation we assume

a) $E(\varepsilon_i)=0$ and $E(f_j)=0$ (where E(.) denotes mean or expectation); (b) The two vectors $\underline{\varepsilon}$ and $\underline{f}$ of error terms and factors are uncorrelated; and (c) The covariance matrix ψ of the residuals is diagonal (*i.e.*, no two error terms are correlated), with diagonal elements denoted Ψ_i

Var (ε_i) (with i,j=1,2,...,p or m, respectively, and Var(.) standing for variance). When it comes to testing hypotheses within the framework of FA, we also assume normality for the random variables in the model. For the development of the estimation approach underlying FA, however, it is not necessary to assume any particular manifest variable distribution.

Looking at equation 2, we see that there is no way that we could obtain directly the ƒ from the observed variables $\underline{x}$ since we do not know the error terms $\underline{\varepsilon}$. Note also that, strictly speaking, the errors are latent variables as well, since they are not directly observed or measured. We, however, keep referring to them as errors (or error terms, residuals, or uniqueness factors), to separate them from the variables of actual interest the ''proper'' latent variables collected in the vector $\underline{f}$. In this regard, the equations in equation 3.4 and some reflection upon them reveal that there is no linear combination of the observed variables in $\underline{x}$ that can furnish any factor in $\underline{f}$. That is, the factors are not linear combinations of the observed variables.

Computer software used to analyses the data: Data analysis software is a tool that is used to process and manipulate information, analyse the relationship and correlation between the dataset by providing quality analysis like transcription analysis, discourse analysis, grounded theory methodology and content analysis, and decision-making methods using the statistical and analytical capabilities. For this research data analysis, the researcher has used excel and R software version 4.0.3.

RESULTS

Factor analysis is one of a "data reduction" or "dimension reduction" technique. What this basically means is that we start off with a set of variables, and then by the end of the process we have a smaller number but which still reflect a large proportion of the information contained in the original dataset. The way that the 'information contained' is measured by considering the variability within and co variation across variables, that is the variance and co variance (*i.e.*, correlation). Either the reduction might be by discovering that a particular linear combination of our variables accounts for a large percentage of the total variability in the data or by discovering that several of the variables reflect another latent variable.

A factor in this context (its meaning is different to that found in analysis of variance) is equivalent to what is known as a latent variable which is also called a construct. A latent variable is a variable that cannot be measured directly but is measured indirectly through several observable variables (called manifest variables). In this research the manifest variables were the promoted numbers of grade ten regular students who took the EGSECE exam in Amhara region from 2001 to 2016 separated by their administrative zone where their schools found (**Table 1**).

Table 1: Correlation matrix of the promoted numbers of grade ten regular students in Amhara region separated by zone their schools found 2001 to 2016.

	East Gojam									
East Gojam	1									
Awi	0.93	1								
West Gojam	0.91	0.95	1							
Bahir dar city	0.51	0.41	0.56	1						
North Gondar	0.9	0.93	0.85	0.36	1					
South Gondar	0.82	0.84	0.87	0.48	0.83	1				
North Wollo	0.35	0.23	0.36	0.95	0.21	0.31	1			
Waghmra	0.81	0.81	0.83	0.43	0.83	0.83	0.29	1		
South Wollo	0.5	0.38	0.49	0.96	0.37	0.41	0.97	0.42	1	
Oromia zone	0.81	0.79	0.78	0.43	0.82	0.73	0.35	0.84	0.44	1

Semen Shoa	0.75	0.73	0.79	0.65	0.67	0.7	0.5	0.8	0.65	0.63	1

The starting point for all factor analysis techniques is the correlation matrix. All factor analysis techniques try to clump subgroups of variables together based upon their correlations and often you can get a feel for what the factors are going to be just by looking at the correlation matrix and spotting clusters of high correlations between groups of variables. For this research data the correlation matrix looks like the data given in **Table 1**.

Tabachnick and Fidell saying that if there are few correlations above 0.3 it is a waste of time carrying on with the factor analysis, clearly **Table 1** shows that in this research data there was not have that problem. While eyeballing is a valid method of statistical analysis obviously some type of statistic, preferably with an associated probability density function to produce a p value, would be useful to help us make this decision. Two such statistics are the Bartlett test of sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy (usually called the MSA). The Bartlett test of sphericity compares the correlation matrix with a matrix of zero correlations (technically called the identity matrix, which consists of all zeros except the 1's along the diagonal). In addition, this test compares the null hypothesis of there are no common factors against the alternative hypothesis of there are at least one common factor that affect the promoted sizes of the national examinees. From this test we are looking for a small p value indicating that it is highly unlikely for us to have obtained the observed correlation matrix from a population with zero correlation and this indicates that there was at least one common factor. The MSA does not produce a P value but we are aiming for a value below 0.5 is considered to be miserable (**Table 2**).

Table 2: Bartlett's test of sphericity and kaiser-meyer-olkin measure of sampling adequacy.

The overall Kaiser-Meyer-Olkin measure of sampling adequacy			**0.78**
Kaiser-Meyer-Olkin measure of sampling adequacy of each item	Zone	MSA	
	East Gojam	0.91	
	Awi	0.8	
	West Gojam	0.82	
	Bahir Dar	0.82	
	North Gondar	0.74	
	South Gondar	0.86	
	North Wollo	0.57	
	Oromia Liyu zone	0.85	
	Waghemra	0.81	
	South Wollo	0.63	
	Semen Shoa	0.74	
Bartlett's test of sphericity	Approximate Chi-square	degree of freedom	P value
	2346.749	55	0

The result in **Table 2** shows that the research data had good values for all variables for the MSA and the overall value was 0.78, and Bartlett's test of sphericity had an associated P value of 0.000! So, from the above results the researcher knew that it could now continue and perform a valid factor analysis (**Figures 4 and 5**).

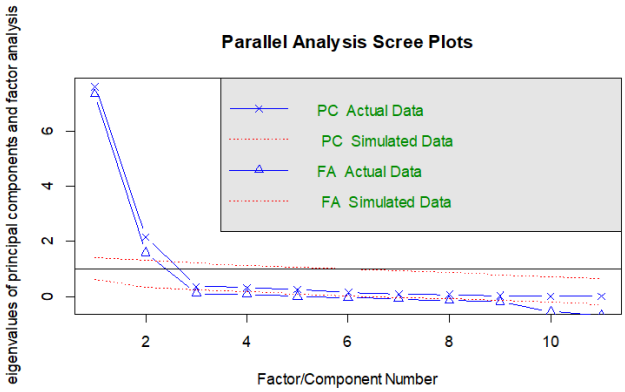

Figure 4: Parallel analysis scree plots.

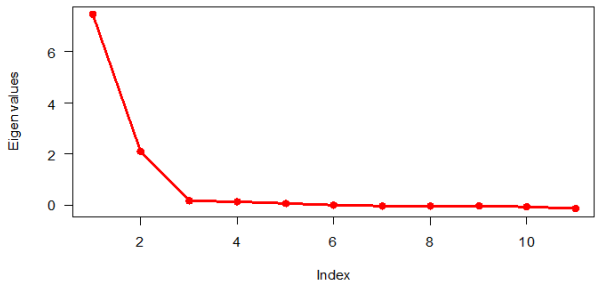

Figure 5: Scree plot of Eigen values.

After checking that there were common latent variables affecting the deteriorated size of the promoted numbers of the examinee students in the region separated by administrative zone where their high schools found the researcher has to determine how many factors need to consider. To do this the researcher used the scree plot and the parallel analysis. As shown in **Figures 4 and 5**, the parallel analysis and the scree plot suggests that there were two latent common variables and two components in the year 2001 to 2016 that deteriorates the promoted sizes of grade ten national examination examinees in the region grouped by their administrative zones. Parallel analysis also suggested that the number of factors were two and the number of components were also two.

When the researcher come to factor extraction step, an initial attempt was made to disclose one or more latent variables that are able to explain the interrelationships among a given set of observed variables (or measures). Although to date there are several different algorithms like principal component analysis, unweighted least squares, generalized least squares, maximum likelihood, miners (ordinary least square), principal axis factoring, alpha factoring, and image factoring that can be used to carry out factor extraction, in this research the researcher used the principal axis factoring method with varimax rotation and the results are shown in **Table 3**.

Table 3: Factor loadings, communalities, uniqueness and complexity of the factor model using principal axis method with varix rotation of the promoted size of grade ten students taking the EGSECE exam separated by their zonal area 2001 to 2016.

Zone	Factor loadings		Communality	Uniqueness	Complexity
	Factors				
	PA1	PA2			
East Gojam	0.91	0.26	0.89	0.11	1.2
Awi	0.95	0.13	0.93	0.07	1
West Gojam	0.91	0.28	0.91	0.09	1.2
Bahir dar city	0.3	0.94	0.96	0.04	1.2
North Gondar	0.94	0.1	0.89	0.11	1
South Gondar	0.86	0.22	0.79	0.21	1.1
North Wollo	0.11	0.98	0.97	0.03	1
Waghmra	0.88	0.2	0.82	0.18	1.1
South Wollo	0.27	0.95	0.98	0.02	1.2
Oromia Zone	0.82	0.22	0.72	0.28	1.1
Semen Shoa	0.71	0.46	0.71	0.29	1.7
		Mean item complexity			1.2

Factor loadings for the principal axis factoring are the correlation between the specific observed or manifest variable and a specific factor. Higher values mean a closer relationship. They are equivalent to standardized regression

coefficients in multiple regressions. The higher the value of factor loadings the better. For this research data as Table 3 tells us the deteriorated promoted size of grade ten students taking the EGSECE exam from 2001 to 2016 in East and West Gojam, Awi, North and South Gondar, Waghemra, and Oromia Liyu zone had strong relationship with the first extracted factor analysis model while the deteriorated promoted size of the students in Bahir dar city, and North and South Wollo zone had strong relationship with the second extracted factor. Further **Table 3** reveals that in the year 2001 to 2016 the declined promoted size of grade ten regular students taking the EGSECE exam in Semen Shoa zone had strong relationship with the two factors extracted by the factor analysis model. Communality for the principal axis factoring is the total influence on a single observed variable from all the factors associated with it. It is equal to the sum of all the squared factor loadings for all the factors related to the observed variable and this value is the same as r square in multiple regressions. The value ranges from zero to one where 1 indicates that the variable can be fully defined by the factors and has no uniqueness. In contrast a value of 0 indicates that the variable cannot be predicted at all from any of the factors. The communality can be derived for each variable by taking the sum of the squared factor loadings for each of the factors associated with the variable. So, as **Table 3** shows for example, for East Gojam its communality was computed as

$$0.91^2 + 0.26^2 = 0.89.$$

and for the other zones their communalities were similarly calculated accordingly. These communalities tell us the percentage of the variability of the manifest variables explained by the latent variables. We want these values to be as high as possible, nearer to one the better.

Uniqueness for each observed variable is that portion the variability of the observed variable that cannot be predicted from the latent variables. Its value is one minus communality. Subsequently, for example, as **Table 3** indicates for Semen Shoa zone we had 1-0.71=0.29 of uniqueness and as the communality can be interpreted as the percentage of the variability that is predicted by the model, we can say this is the percentage of variability in a specific observed variable that is not predicted by the model. This means that we want this value for each observed variable to be as low as possible.

Variable complexity or complexity by row is the number of non-vanishing entries in its associated row of a factor matrix. Specifically, it is the number of factors describing a variable in a particular factor solution. Turnstone indicates that one of the objectives of factor analysis is that finding the smallest numbers of factors for describing each variable and that variables which are of low complexity are good indices of the nature of a factor. For our research as **Table 3** indicates the mean item complexity was 1.2 and this showed that for the year 2001 to 2016 on average two influencing factors were found to predict the depreciated promoted size of grade ten regular students taking the EGSECE exam in the region separated by their zonal area.

Total variance explained indicates how much of the variability in the data has been modeled by the extracted factors. As **Table 4** points out 57 percent of the variation of the promoted size of grade ten regular students taking the EGSECE exam separated by their zonal area in Amhara region were explained by the first extracted factor, 30 percent by the second extracted factor and the rest 13 percent were elucidated by the error or the disturbance term or the uniqueness of the factor model. Besides **Table 4** reveals that 87 percent of the variations of the deteriorated promoted size of grade ten regular students taking the EGSECE exam separated by their zonal area in Amhara region were modeled by the two extracted factors. Of these 87 percent of variations 66 percent were explained by the first extracted factor and the rest 34 percent by the second factor of the factor analysis model.

Table 4: Total variance explained by the factor model using principal axis method with varimax rotation of the promoted size of grade ten students taking the EGSECE exam separated by their zonal area 2001 to 2016.

Extraction sums of squared loadings	Factors	
	PA1	PA2
Total	6.3	3.27
Proportion of total variance explained by	0.57	0.3
Cumulative proportion of total variance explained by	0.57	0.87
Proportion explained variance by	0.66	0.34
Cumulative proportion explained variance by	0.66	1

In giving the extracted factors meaning it is essential to use different rotation. In this research data the researcher used varimax and promax rotation. Varimax rotation demanded that the factors are orthogonal while promax rotation assumes the factors are correlated. The factor loadings with varimax rotation are shown in **Table 3**. As shown in **Table 5** by allowing the two latent variables to correlate which has resulted in a correlation of 0.47 the factor loadings have changed little.

Table 5: Factor correlation matrix using Principal Axis (PA) factoring method with promax rotation.

Factor	Factor	
	PA1	PA2
PA1	1	0.47
PA2	0.47	1

As education researcher, the researcher suggested that the first latent variable that affected the promoted sizes of grade ten regular students taking the EGSECE exam separated by their zonal area in Amhara region was school factor while the second construct was out school factor.

DISCUSSION

Academic performance is the measurement of student's achievement across various academic subjects. Teachers and education officials typically measure achievements using classroom performance, graduation rates, and results from standardized tests. In Ethiopia from 2001 to 2019, EGSECE exams were one of the standardized national exams given to grade ten students for each year, usually on the end of May or on the beginning of June.

In the study the result by factor analysis with varimax and promax rotation methods on the promoted size of grade ten students taking the EGSECE exam from 2001 to 2016 separated by their zonal area in Amhara region revealed two latent constructs, and the researcher named these two constructs as in school and out school factors. The in school factors that affect student's performance include the school environment, instructional materials, school facilities, and characteristics of teachers. While the out school factors influencing the students result comprises family related, socio economic, political interference and psychological reasons. The correlation between the numbers of national exam passers and the latent variables and the total influences of the constructs in deteriorating the numbers of exam passer students in the different zones of the region were very high. The promoted size of grade ten students taking the EGSECE exam from 2001 to 2016 in East and West Gojam, Awi, North and South Gondar, Waghemra, and Oromia Liyu zone were largely affected by the first latent variable while the promoted size of the students in Bahir dar city, and North and South Wollo zone were highly influenced by the second extracted factor. The study results further revealed that in the year 2001 to 2016 the promoted size of grade ten students taking the EGSECE exam in Semen Shoa zone was strongly affected with the two factors extracted by the factor analysis model. The result also pointed out 57 percent of the variation of the promoted size of grade ten students taking the EGSECE exam separated by their zonal area in Amhara region were explained by the first extracted factor, 30 percent by the second extracted factor and the rest 13 percent were elucidated by the error or the disturbance term or the uniqueness of the factor model. This implied that 87 percent of the variations of the promoted size of grade ten regular students taking the EGSLCE exam in the specified period separated by their zonal area in Amhara region were modeled by the two extracted factors. Of these 87 percent of variations 66 percent were explained by the first extracted factor and the rest 34 percent by the second factor of the factor analysis model. As MOE stated that "the learning environment is determining factor for student's performance and survival at any given educational level." But in Amhara region as the Regional Bureau stated in November 2019 report disclosed by the Ethiopian Television (ETV) news discovered only 16 percent of its schools fulfill such condition. Odaga and Heneveld argue that the school environment, teacher's attitude and pedagogy, and bias in learning materials affect the performance and attainment of students. Further Griffith indicated both home and school environments have a strong influence on performance of students. While Heyneman and Loxley argued in their study school characteristics have minimal effects on school outcomes. The instructional materials such as textbooks, modules, reference books, magazines, new audio visual (plazma) and other equipment were very crucial in facilitations effective learning and to improve the quality of education. Tekeste stated that in Ethiopia school teachers have no teaching materials designed to assist them and text book which one load to students against payment were always in short supply in most case several students share the text books. This revealed that one of the major problems in secondary school was shortage of instructional materials which could affect both the work of teachers and students. In support of the previous ideas based on the data obtained from ministry of education in inspecting the quality standard of schools by measuring school inputs, process and outcomes in the country, the news of Ethiopian television on the date November 27, 2019 revealed that 84 percent of schools found in Amhara region have instructional materials deficiency and they are below the quality standard. School facilities in which the formal teaching learning occur ranges relatively from modern and well equipped to open air gathering place. The school infrastructure includes the class rooms, offices, toilet rooms, water supply, electricity services, technology services, computer laboratory, science laboratory, library, staff lounges, attractive green area, swimming pool UNICEF. According to MOE school facilities includes water supply, latrines (male and toilet) clinical laboratory, library, pedagogical center, and laboratory. The facilities are required to be proportion to the number of teachers and students in the school for the provision of quality education in schools.

However, as the report of the regional education bureau on the date November 2019 disclosed only 16 percent of schools found in Amhara region have fulfilled the physical facility standard in their book and study were concluded effective teaching is determined by teachers knowledge of subject matter and mastery of pedagogical skill which creates positive effect on student's academic performance. Nevertheless, due to in and out school infrastructures, and in efficient salary problems, as the regional council discussion on education quality in April 2017 presented by Amhara television in associated with the regional education bureau pointed out that in Amhara region most of the subjects not covered timely and the different subjects were covered by unrelated professionals and even if they were professional their education level were below the standard. Transportation, electricity utility, internet facility, household economy, status of role models, living cost of households and employment opportunity of graduates have had a great role on students performance. However, in Amhara region the road, electricity and internet utility coverage were very low, the cost of living of households were increased, the unemployment rate of university, college and technical school graduates were high, and there were small numbers of university graduate entrepreneurs. These factors directly or indirectly impacted the EGSECE exam results of the students in the region. Further for students in addition to their elder brothers and sisters, and their elder neighbor university graduates their teachers were their role models. However, because of high inflation and less monthly salary the living standard of their teachers were very low and the unemployment rate of university graduates in the region were very high and such causes inversely influenced the students psychology to obtain pleasant results in their EGSECE exam scores. The other out school factor that affects student's success was political interference. Allen, Human Rights Watch (HRW) and Bureau of Democracy Human Rights and Labor (BoDHRL) were concluded that in Ethiopia there were political incorporation interests in school decision making, lack of transparency in academic staffing decisions, and numerous complaints from individuals in the academic community of bias due to party membership. In line with this the regional council concluded in their meeting on evaluating the education quality during April 2017 presented by Amhara television in the 'Fnote Ewqet' program in associated with the regional education bureau, there were political interference in schools and academic freedom was more precarious. And this deteriorated the quality of education in the region.

CONCLUSION

Examinations are given to certify completion of a program at a satisfactory level of achievement, and select candidates for higher education, professional training, and thus, ultimately, for employment. The prospect of the examination affects student's motivation to achieve, influencing the quality of his/her work; the test paper itself legitimizes the school's course of study and shapes what teachers do in the classroom; and the results form part of parents' evaluation of their children's schooling. While not always conclusive, examinations have powerful influences on individual's success in adult life. They also serve as a gauge of the quality of a nation's educational efforts and its workforce. Taxpayers and politicians use the results to estimate how well national resources have been spent, to measure the status and relative progress of regional, social, or ethnic group relative to another, and to compare their nation's educational level with that of other nations.

The performance of grade ten students taking the national examinations in Amhara region from 2001 to 2016 revealed the quality and internal efficiency of the education environment were deteriorated. For this worsen performance of grade ten Amhara Region students in their national examination results in the specified period the study identified correlated hidden school and out school influencing determinants. Some of the school factors that influences the student's performance were the school environments, instructional materials, school facilities, and characteristics of teachers while the out school hidden constructs that affect the students result comprised family related, socio economic, political interference and psychological reasons.

The deteriorated performance of the students in the national examinations in the year 2001 to 2016 in some administrative zones of the region were highly affected by the former hidden factors and some others with the later construct. The decrement of the promoted size of grade ten regular students taking the EGSECE exams from 2001 to 2016 in East and West Gojam, Awi, North and South Gondar, Waghemra, and Oromia Liyu zone had strong relationship with the first extracted factor analysis model while the decline of the promoted size of the students in Bahir dar city, and North and South Wollo zone had strong relationship with the second extracted factor. Meanwhile the deterioration of the promoted size of grade ten students taking the EGSECE exams in Semen Shoa zone in the specified periods had strong relationship with the two constructs extracted by the factor analysis model.

Most of the variations of the decrement of the promoted size of grade ten regular students taking the EGSECE exams from 2001 to 2016 in the region were explained by the two hidden factors. 57 percent of the variation of the deterioration of the promoted size of grade ten regular students taking the EGSECE exams separated by their zonal area in Amhara region were explained by the first construct, 30 percent by the second extracted factor and the rest 13 percent were elucidated by the error or the disturbance term or the uniqueness of the factor model. This implied that 87 percent of the variations of the promoted size of grade ten regular students taking the EGSECE exam in the specified period separated by their zonal area in Amhara region were modeled by the two extracted factors. Of these 87 percent of variations 66 percent were explained by the first extracted factor and the rest 34 percent by the second factor of the factor analysis model.

There were many researches done on student's performance in schools. Nevertheless, in Amhara region little information exists on hindering latent constructs that affect their EGSECE exam results. Generating valid indicators help for policy makers and officers who permit them for evaluation and

monitoring of schools, teachers, programs, and students. Identifying latent variables that affect student's performance in national examinations in the region will help education bureaus and offices, policy makers, planners, teachers, education supervisors, communities, and students alleviate their influences in students' future national exam results.

School principals, unit leaders, teachers, families and communities are very important for the success of students in their national exams. However, because of time and budget constraint for this research the researcher does not collect data from them directly. Also, budget allocated for education, political and financial corruption, political instability of the region, English language knowledge of students, passing cut point of the exam in each year, drug addiction behavior of students, students cheating behavior in exams, unemployment rate in the region, living cost of households, and availability of electricity and road facilities impacted the students' performance in their EGSECE results. Yet in this research the researcher has not seen their direct influences. In this research during analyzing the data using factor analysis model since Gondar and Dessie city administrations were started their zonal equivalence administrations in the region in 2011/2012 the researcher ignores their effects and included the registered, examined and promoted grade ten students in the cities respectively in North Gondar and South Wollo zones. Further in this research during analyzing the data using factor analysis the researcher has ignored the time effects, and the researcher analyze the data by adopting indirect methods. So, for future studies the researcher recommends other models like panel data analysis techniques to see the time and spatial effects on the student's national examination results.

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COMPLIANCE WITH ETHICAL STANDARDS

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