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An Investigation in to the Combined and Relative Influences of Some Selected Factors on Students' Performance in Physics Among Secondary Schools of Bale Zone, South East Ethiopia

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Abstract
The main purpose of this study was to determine the relative and combined influences of selected factors (parental, teacher, school and student related factors) on students' performance and level of students' performance in Physics among selected secondary schools of Bale Zone. The research methodology employed in the study was a descriptive survey of ex-facto type. Purposive, stratified and simple random sampling techniques were used to select 472 participants of the study. Educational administrators (principals or vice principals), Physics teachers, students, and supervisors at zonal levels were the subject of the study. Questionnaire, Physics achievement test and interview schedules were the major data gathering instruments used for the study. Besides, personal observation checklist was used to get additional evidences to the study. Percentages mean values and grand mean were the statistical tools used to determine students' level of performance in Physics and multiple linear regression analysis was used to determine the relative and composite influences of some selected variables on students' performance in physics. The findings of the study in general, revealed that, majority (74.8%) of the students scored below a pass mark in Physics model exam result. The regression analysis indicated that 72.5% of the variance in the performance of students in physics is significantly predicted by the combination of school, student parental and teacher related factors. School related factor was the single best predictor of students' performance in Physics with beta weight of 0.472 (47.2%).The finding also showed that, teachers had lack of competency in their subject and method of teaching as well as lack of interest and motivation to be engaged in their professional tasks. It was also indicated that students showed a decline interest in learning Physics. Based on the findings, Physics teachers should be given training on skills of performing practical activities through effective utilizations of available laboratory resources. Moreover, school managements, teachers, the community and the government at large must give consideration to the capacity building of the schools in terms of finance and training so that schools would be able to prepare laboratories with basic facilities and carrying out practical activities.
Keywords: performance, physics, factors

1. Introduction

1.1 Background of the study

No nation can attain any reasonable level of development without meeting the vital demands of development particularly in the areas of science, technology and mathematics. Like any other country, Ethiopia has recognized the development of the country is based on the development of science and technology. A strategy making 70% of the university enrollment to be in science and technology was also designed and being implemented in the country. The underlying assumption for this strategy is that science and technology is the bedrock for the economic growth of the country (Eshetu, Dilamo, Tsfaye&Zinabu, 2009).

Physics, as a fundamental science, provides a basis for creative work in various fields of modern science and technology and offers an excellent background for various professional studies and competence in effectively relating what is learnt in school to real life situations outside of school (Ekanem, 2000). Physics education is generally aimed at equipping the individual learner with such knowledge, skills and attitudes that will enable him/her to live a meaningful and fulfilled life and contribute positively to the development of the society from which he can derive maximum social, economic and cultural benefits (NERDC, 2004).

Yet, in spite of the great importance of physics in our national development and the efforts being made by the government, students' performance in Physics have been poor and unsatisfactory even as compared to other science subjects (NAE, 2010). In a study conducted by Solomon and Kedir (2015) in Wolaita and Dawuro zones, the majority of students in the secondary schools, especially in grade 9 & 10 had no interest to learn Physics and this resulted in low achievement in Ethiopian General Secondary Education Certificate Examinations (EGSECE).

Several factors have generally been identified for students' poor performance in Physics. According to Diaz (2003), there are three major elements that intervene in education: parents (family causal factors); teacher (academic causal factors); and students (personal causal factors).Moreover, research, conducted in Kenya by Samson and Simon (2015) identified the three major factors associated with students' performance in Physics. These are factors that emanate from the teacher (teaching factor), factors that emanate from the learners (learning

factors) and factors embedded in the context within which the school system operates (administrative factor).

Generally, review of various literatures indicated that, there are four general factors known to influence students' performance in Physics. These are, family related factors, student related factors, teacher related factors and school related factors. Research results that have been found by various researchers predicted the individual influence of these variables on students' performance in Physics .However, there is need for further research which investigates again, in another setting when there is a need to determine the prevalent factor associated with students' poor performance in Physics. This is because of the fact that indentifying the most important variable will help to devise possible intervention mechanisms for alleviating the problem. Thus, this study was designed to determine the level of grade 10 students' performance in Physics and the relative and composite influences of selected factors (family related factors, student related factors, teacher related factors and school related factors) on students' performance in Physics.

Since each of the factors have several issues, in the context this study we put the following points in to consideration. Teacher related factor focused on teachers' competency i.e. quality of interaction with students and pedagogical content knowledge; student related factors focused on students' attitude towards Physics; school related factor focused on accesses to resources (books, laboratory materials computers and other facilities) and quality of guidance provision (administration) and family related factors focus on parents' involvement in supporting their children.

1.2 Statement of the problem

Lots of problems were observed in the teaching and learning of Physics in the secondary schools of the country even though increased importance has been placed to the study of Science (MoE, 2008). There has been a trend of poor performance in Physics in Ethiopian Secondary Schools. . The Ethiopian national learning assessments indicated that compared to other subjects, students' performance in physics is the least (NAE, 2010). In a study conducted by Solomon and Kedir (2015) in Wolaita and Dawuro Zones, also indicated that the majority of students in the secondary schools, especially in grade 9 & 10 had no interest to learn Physics and this resulted in low achievement in EGSECE. In the area under investigation the results of Ethiopian National Higher Education Entrance Examinations (ENHEEE) revealed that about 14.73% and 2.8 % students scored a pass mark in the year 2015 and 2016 respectively. How it is possible to place 70% of preparatory graduates to higher learning institution in science and technology stream where students have low achievement in science subjects in general and Physics in particular? So students' poor performance in Physics should have to be a source of concern to the nation which aspires to accumulate competent human power in science and technology. It is therefore necessary to gear research work in Physics Education towards finding solutions to the most important factors. The researcher's interest on the problem was motivated by the need to identify the factors that potentially influences students' performance in Physics. To address these issues, the following research questions directed the study:-

1. What is the level of performance of grade 10 students' in Physics in selected secondary schools of Bale Zone?
2. What is the relative and composite contribution of selected factors (parental, teacher, student and school related factors) to students' performance in Physics in selected secondary schools of Bale Zone?
3. Which among the factors would greatly influence students' performance in Physics in selected secondary schools of Bale Zone?

3. Methodology

3.1 Description of the Study area

The study was conducted in Bale Zone which is located in south east Ethiopia .It shares common boundary with Somali National Regional State of Ethiopia in the East, East Hararge Zone in Northeast, West Hararge Zone and Arsi zone in the North, West Arsi Zone in the West and Guji Zone in the Southwest (Atlas of Bale zone, 2004). It is characterized by highlands, lowlands and rugged areas, incised river valleys, deep gorges and flat topped plateaus. The surfaces rises from about less than 300m above sea level (Southeast Rayitu,Gurra,Damole and MaddaWalabu) to a high ranges culminating into mountain *Tulu Dimtu* (4377m), the highest peak in the Zone. The high land plateaus embrace the *Sannate* plateaus (Bale Mountain National Parks-) and Mount *Tulu Dimtu.* According to the Bale Zone Education office , there are 56 secondary schools out of which 48 have G-10 students in the year 2015/2016 and with an estimated enrolment of 7325 Grade 10 students.

3.2 Research Design

This study employed ex-post-facto research design in which the existing status of the independent variables were only determined during data collection without any manipulation of the variables by the researchers. The study involved triangulation research methods in which both quantitative and qualitative research methods was employed in order to check and maintain validity and reliability of the study results.

3.3 Sample size and sampling procedures

This study involved 472 participants which consisted of 420 students, one education officer at zonal level, 10 principals of schools, 20 Physics teachers and 20 parents from the sampled secondary schools of Bale Zone. Different kinds of sampling techniques were used to select the samples of the study. Stratified sampling technique was used select sample schools. The number of Secondary Schools of Bale Zone (49) were divided in the two clusters namely 24 pastoralist (rural) and agro 25pastoralist (urban) based on socio economic conditions of Bale Zone. . The number of sampled schools were selected from each clusters based on (Geneserth et al, 1987), which is the sample size of 10% to 20% is acceptable in a descriptive survey study. Thus, taking 20% of sampled schools from each cluster, 5 schools from each total of 10 schools were selected using simple random sampling method. HaroDumel, Agetu, ,Welabu MelkaMicha and Delomena secondary schools were taken from pastoralist and Dinsho, Gasera,Goba, Goro and Jara Secondary Schools were taken from agro pastoralists areas. Purposive sampling technique was used to select 20 parents; 2 parents who are a member of Parent Teachers Association from each school, and 20 Physics teachers including head departments; 2 from each school. Available sampling technique was used to select 10 principals; 1 from each school and one Zonal educational officer. Simple random sampling technique was used to select 420 students, 42 from each school.

3.4 Instruments

The study used four data gathering instruments, namely Physics achievement test (PAT), questionnaires, interview schedules and observation checklist. After reviewing related literatures, a questionnaire having three parts was developed for students. Part one is about demographic characteristics, part two is about socio-economic status of parents and part three items eliciting information about selected factors (independent variables). Each of the Questionnaires consisted of five point Likert Rating Scale from SA – SD. Interview schedule was prepared for Physics teachers, school principals, supervisors and parents. Model examination of Grade 10 students was taken as PAT to determine the level of Performance of Grade -10 students. Observation checklist was prepared related to the independent variables which are important for strengthening the power of the questionnaire. This check list was used to observe physical facilities like library, laboratory, pedagogical center and teachers' competency of each sampled schools. The validity and reliability of the instrument were determined by trial testing the instrument on t similar set of the sample and the Kurder- Richardson 21 formulas was used to obtain the inter-item reliability coefficient of 0.80 and 0.75 respectively.PAT was taken without piloting since it was prepared by well experienced Physics teachers and experts at regional level.

3.5. Procedure of Data Collection

At the very initial level, the total number of grade 10 students was collected from the principal of each school through telephone. Based on the collected data, the size of the target population was known. Then the sample size for each school was set using the target population of each school. Subsequently, discussion was conducted with principals of each school as to how documents would be obtained and how and when the questionnaires should be distributed to students.

Students' Model exam result (PAT) was obtained from the archives of each school and the list of students that are currently learning was obtained from the roster. Before the students started filling in the questionnaire, the purpose of the study was explained by the researchers and oral instructions were also given. The questionnaire was administered in the respective schools during regular class periods. Students were told not to discuss on the items as the response of one student may be influenced by the other. The questionnaire was administered to 420 students. The analysis was made using 362 students. Ten questionnaires were discarded because the respondents gave incomplete or inappropriate information. In-depth interview was conducted and observation was made by the researchers themselves.

3.6. Data Analysis Techniques

Data were analyzed using percentage, mean and standard deviation for research question one and multiple linear regression analysis to answer research questions number two and three. Data were tested for significance at the .05 level. For the qualitative data, transcription of the recorded data from interviews and observation was done by reading and re-reading of the transcripts to identify the main ideas based on the similarities and differences in the data collected, and to compare the qualitative and quantitative data.

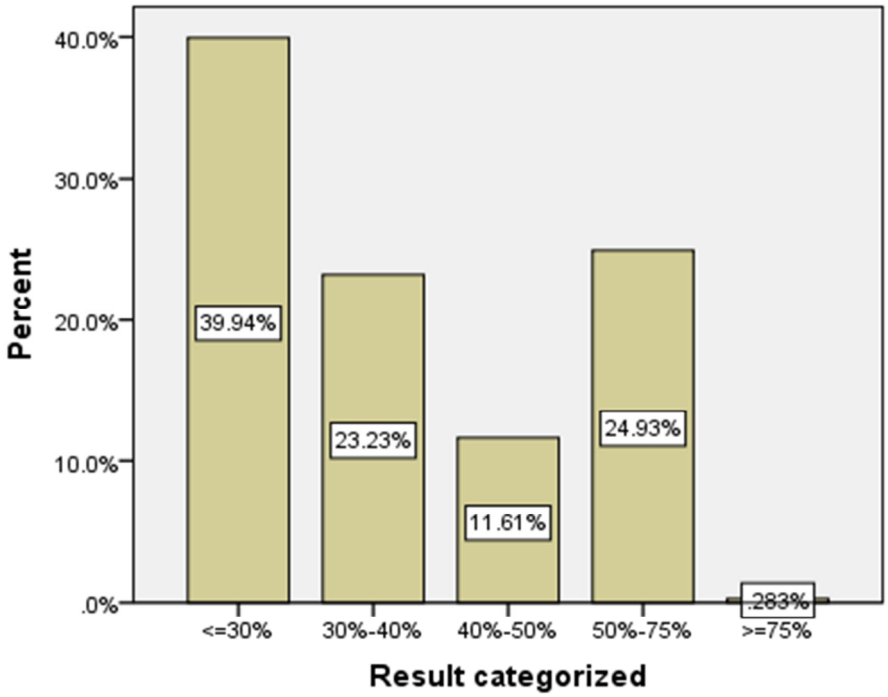
4. Result and Discussions

Research Question 1: What is the level of performance of grade 10 students' in Physics in selected secondary schools of Bale Zone?

The grand mean score of students' in the regional model exam was found to be 38.31. About 74.8% the students did not score a pass mark in the model examination. This score was less than the expected average score (50% set by the Education and Training Policy (1994) of Ethiopia. Thus majority of the students (74.8%) in selected

SSBZ are low achievers. The graph indicated that 39.9% of the students scored below 30%.

Fig. 1 distributions of students' result



This result is in lined with the study conducted by Solomon and Kedir (2015) in Wolaita and Dawuro zones, the majority of students in the secondary schools, low achievers in Ethiopian General Secondary Education Certificate Examinations (EGSECE).

Research Question 2: What is the relative and composite contribution of selected factors (parental, teacher, student and school related factors) to students' performance in physics in selected secondary schools of Bale Zone?

Table 1: Summary of the regression analysis

R	R Square	Adjusted R Square	Std. Error of the Estimate
.68	.725	.585	5.72863

Dependent Variable: students' performance Predictors: (Constant), teachers factor, parental factors, students factor and school factors

Table 1 shows the summary of the regression analysis of the selected variables. The table revealed that the entire four variables considered in this study yielded a multiple correlations coefficient of 0.68 and a standard error of 5.73. This implies that, on the average, the predicted performance of grade 10 students in Physics will deviate from the true value by 5.73 in the limit of that measure. This table further indicates that there was a positive and moderate linear correlation (0.585) between the sets of the independent variables and dependent variable. This implies that 72.5% of the variance in the performance of students in physics is significantly predicted by the combination of school, student parental and teacher factors.

Table 2: Analysis of variance for multiple Regressions

Variations	Sum of Squares	Df	Mean Square	F	Sig.
Regression	12493.121	5	2498.624	15.422	.000
Residual	32241.569	199	162.018		
Total	44734.691	204			

a. Dependent Variable: students' performance

b. Predictors: (Constant), teachers' competency, parental involvement , students factor an school factors significant at the 0.05 level

Table 2 shows the analysis of variance of the multiple regressions. The table reveals that the F-ratio of 15.422 and a significant value of .000 which indicate that all the for independent variables, that is teachers' competency, parental involvement, student related factors an school factors have positive and significant relationship with the academic performance of grade 10 students in Physics in selected secondary schools of Bale zone.

To determine the relative contributions of selected variables to the prediction of grade 10 Students'

performance in Physics, regression analysis was conducted.

Table 3: Regression coefficients of the independent variables on the prediction of dependent variables

Predictor variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Parental evolvement	.170	.784	.298	4.996	.000
Student factor	.172	.852	.343	2.454	.005
School factors	.644	.904	.472	2.877	.000
Teachers' competency	.320	1.010	.364	.900	.001
(Constant)	9.657	5.783		1.670	.000

Dependent Variable: students' performance in Physics.

The implication of these results is that each of the four independent variables significantly predicts students' performance Physics. The final regression model was as follows:

Y= 9.657+.298X1+.343X2+.472X3+.364X4, where

Y=students' performance in Physics, X1=parental involvement, X2=student factor, X3=school factor and X4=teacher related factor.

Table 3 shows the regressions coefficient of the four independent variables in the prediction of students' performance in Physics. School factor is the single best predictor of students' performance in Physics with beta weight of 0.472 (47.2%). This was closely followed by teachers competency with a beta weight .365 (36.5%), students factor .343 (34.3%) and parental involvement with beta coefficient .298(29.8%) respectively.

Research Question 3: Which among the factors would greatly influence students' performance in Physics in selected secondary schools of Bale Zone?

The result of multiple regression analysis indicated that school factors (school facilities and quality of guidance provision) was found to be the most potential factor influencing students' performance in Physics. As it is shown in table 4, the beta coefficient of the regression is .472.

This finding is supported by the interview and physical observations made in each school. While expressing a concern about the access to physical resources, majority of teacher-participants remarked: "How do you expect student to attain good results in Physics when the school has only one laboratory which is not well equipped and functional?" Moreover, teachers reported that they had only outdated and exam oriented Physics reference books. They argued that they ought to have a variety of Physics reference books for effective teaching. The student-participants also agreed with this, about 75% of the student-participants strongly agreed that they had not been engage with practical activities while learning Physics. Teachers from the interview justified that they lack skill in using available laboratory materials in teaching their students. Lack of concern of school principals on implementing practical activities were also the reasons forwarded by the respondents. All of the above suggestions were confirmed by our physical observation made in each school. The finding also showed that, teachers' lack of competency in their subject and method of teaching as well as lack of interest and motivation to be engaged in their professional tasks and declining interest of students to learn Physics. The findings are in line with the studies of Solomon and Kedir (2015) and Samson and Simon (2015) which identified major factors associated with students' poor performance in Physics.

Fig.2: Physics books in the library

Fig. three:-appearances of laboratory equipments in sampled schools

5. Conclusions and Recommendations

5.1 Conclusions

The main concern of this study was to determine the relative and combined influences of selected factors (parental, teacher, school and student related factors) on students' performance and level of students' performance in Physics. The study revealed that 74.8% of the students are low achievers. I.e. they scored below the standard set by FDRE(1999). The result of multiple regression analysis indicated that school related factors are the single most potential factors influencing students' performance in Physics. Standardized beta coefficient of the regression is 0.472 which is to mean 47.2% of the result is affected by school related factors. Teachers' competency is the second most influential factor affecting students' performance in physics, 36.4% of the students' result was affected by teachers' competency. Finally student related factors and parental enrolments were the least predictors of students' performance in Physics at SSBZ respectively. The finding also showed those teachers' lack of competency in their subject and method of teaching as well as lack of interest and motivation to be engaged in their profession. Moreover students were found to have low motivations and interest in learning physics.

5.2 Recommendations

- In order for teachers to be well prepared to meet the challenges of teaching physics in a school with limited teaching/learning resources, it is important for teachers to give training on skills of performing practical activities through effective utilizations of available resources.
- The school administration should ensure that the curriculum is implemented as intended by supervising the teachers to ensure that the intended curriculum is covered in time.
- Physics teachers should use practical activities in physics lessons to engage the learners and to sustain their attention. In addition, the use of student-centered pedagogies in physics classrooms should be the norm rather than an exception.
- Besides, the Physics teachers need to have good student–teacher relationships where students are free to interact with teachers.
- School managements, teachers, the community and the government at large must give consideration to the capacity building of the schools in terms of finance and training so that schools would be able to prepare laboratories with basic facilities and carrying out practical activities.
- The role of Parents Teachers Associations should be strengthened through legal enactments so that together they can contribute constructively to the development of their schools especially in the provision of physical infrastructure and instructional learning resources.
- Developing team works of teachers in each science subject to carry out a preliminary experiments and demonstrations before participating students in practical works. This saves resource wastage, time and energy of teachers and students.

- There should be professional development activities for secondary school physics teachers organized by MOE, NGOs, or by any concerned bodies.
- The curriculum designers should give emphasis to the practical works of physics in relation to the assessment techniques, the time allocation for conducting practical works, the class size, training systems of teachers and technicians.

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