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Performance of High School Students in Vhembe District

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Abstract: Despite the attempts by South African government to make education accessible to all by introducing free food and free textbooks at the primary school level, there is still high failure rate in mathematics and science in high schools in the country. This study makes attempt to establish some factors that affect the performance of students, especially in science subjects in high schools in the Vhembe district in the Limpopo province. A survey was conducted in 17 high schools randomly sampled in the Vhembe district. Purposive sampling was used to get the grade 11 and 12 students and their teachers. About 700 students, 70 teachers and 17 principals were interviewed. The study concludes that the overall pass rate is 70% but the rate in mathematics and science is hardly 40%; and the key factors affecting performance are lack of laboratory for practical, awards, shuffling and textbooks. The study recommends that science laboratories be built in schools, textbooks be supplied in good time and teachers to motivate students by giving awards.

Keywords: *Shuffling, laboratory, textbooks, awards, educational environment*

1. Introduction

Poor performance of students in high and higher institutions in South Africa comes from many dimensions – unqualified staff, staff members who are neither committed nor regular at school and a host of them. High schools are meant to prepare students (learners) for colleges or tertiary institutions which have the clear duty internationally, to build the right set of knowledge, skills and attitudes that will increase the employability of students. Good academic performance in high school is therefore crucial and that requires a positive school environment for students to feel comfortable in school, much as at home. Education and skills development promote individual, social and economic development. High quality education and appropriate competences and capabilities are prerequisites for growth, development and citizenship, which in turn can afford more people the opportunity to learn to enhance their capabilities and to contribute to a productive society (McGrath, 2010: 2). For decades and even now a lot of constraints have hampered academic performance at high school level in South Africa. Unqualified teachers, shortage of staff, inadequate resources, teenage pregnancies and lack of support and mentorship, have all contributed to the poor performance of students in high schools. Education and training during the old regime in South Africa was characterised by the underdevelopment of human potential, especially among the blacks. The teaching and learning of Mathematics and the Sciences, in particular, were affected the most. For example, the Third International Mathematics and Science Study conducted in 1995, in which South Africa participated with 41 others, reported that South Africa students came last with a score of 351 (Mji and Makgato, 2006: 253). In 2013, they again came last with a score of 380. Post-apartheid African National Congress government has repeatedly said that they have come to redress the inequality that existed during the apartheid regime. They came with a formula which states, among other things, that the poorest 40% of schools should receive 60% provincial schooling non-personnel budget allocation; and the less poor 20% of schools are to receive 5% of the resources (National Maintenance Act, (NNSSF Act), 1998). The question now is: has this formula been able to redress the poor performance of the rural students in Vhembe? This paper examines the performance of grade 12 (form five students in high schools) in the Vhembe district and, determines factors affecting performance and recommends measures needed to turn the negative results around.

2. Literature Review

Although there are substantial global efforts to increase and improve the scientific literacy in the country, it has however been recently realized that the science education systems are turning out less science graduates at all levels than the global economy requires (Muwanga-Zake, 2008: 1, Muzah, 2011: 112; Cameron,

2009:15-16; Einhorn, 2008: 2). There has been a decline in science graduates all over the world and that has contributed to failure rate in schools (Fonseca and Conboy, 2006:82; Madibeng, 2006:1-2).The most common problem linked to students' poor performance in science in most developed countries is mainly shortage of qualified and experienced science teachers (Ruby, 2006: 1007). In contrast, most developing countries, including South Africa, have a host of factors ranging from lack of adequate science resources and facilities such as apparatus and laboratories, shortage of trained and qualified science educators, large science classes, limited proficiency in medium of instruction to outdated teaching methods (Howe, 2003: 1-2; Makgato, 2007: 90; Mji and Makgato, 2006:259-261; Muwanga-Zake, 2008: 4-6). Studies have associated shortage of qualified teachers with lack of thorough preparation for lessons and reduced coverage of content (Muzah, 2011: 109).

Education researchers in South Africa agree that there are acute shortages of teachers, especially in Sciences and Mathematics. Many institutions in the country lack infrastructural facilities that promote healthy learning (Ardens, 2010: 1-3).There are several studies locally and internationally regarding poor performance at high school level. These studies revealed that in many cases the level of academic performance in urban and rural areas is not the same, and that the urban students tend to perform better than those in the rural areas (Saiduddin, 2003: 22; Themane, 1989: 151; Munn, 1996:44). However, Kyei and Nemaorani (2014) found out that the performance of grade 10 (form three students) in rural areas in the Vhembe district is rather better than in urban areas; the reason they attributed to lack of entertainment/social centres in rural areas to attract and distract students from their studies. According to Muzah (2011:54), the views and opinions of educators and learners showed that the main causes of high failure rates are poor teachers' qualifications, outdated teaching methods, massive workloads, high levels of absenteeism and acute deficiencies in aspects related to: resources, subjects content, classroom management skills, proficiency in language of instruction and assessment, motivation and perseverance as well as poverty.

The UN convention on the Rights of the Child states that every child has the right to an education that develops their personality, talents, mental and physical abilities to their fullest potential (*www: unicef.org/southafrica).* And every school's mission should be the education of students to become knowledgeable, responsible, socially skilled, healthy, caring and contributing citizens (*www: unicef.org/southafrica).*Though there are increasing levels of female school participation in South Africa as elsewhere in sub-Saharan Africa, a great number of young female students become pregnant, perform poorly or fall out of school; and the (pregnancy) prevalent rate in South Africa is shocking (Grant and Hallman, 2006:12). The high failure rate in Mathematics and Science in South Africa continues to be very disturbing and creates concerns, especially in historically disadvantaged townships and rural public high schools. Under-achievement in Science and Mathematics in these schools is skyrocketing in an era when the ability to apply science is spreading out at an exponential rate to the daily lives and worldwide events (Muzah, 2011:91). Maybe the underlying reasons for under-achievement of students in science at final year (matriculation) level, particularly in historically disadvantaged public high schools of South Africa, have not yet been sufficiently researched or appropriately treated.

3. Methodology

Material/Data: A survey was conducted within seventeen high schools randomly sampled in the Vhembe district. The principals, teachers (educators) teaching science subjects and students in grades 11 &12 (forms 4 & 5) were purposively selected from the sampled schools and interviewed. About 700 students, 70 teachers and 17 principals were involved. Some of the questions in the questionnaire were the following: Does class size affect academic performance? Do you do Physics practical in your school? Do you do Life-Science practical in your school? Do you have a textbook for each subject that you are taught? Are you shuffled in your school/classes? And do you get Awards if you have performed well academically?

Analysis: The analytical tools employed for this study include a logit model and multiple regressions. A logit model is a useful measure to study the relationship between a binary response variable and one or more explanatory variable(s). Multiple regression modelling provides an elegant method of describing a relationship between a response variable and predictors. The models provide improved precision for estimation and prediction by using a linear surface such as a plane or hyper plane to approximate the relationship between a continuous response variable and a set of predictor variables (which may be continuous or categorical) (Larose, 2006: 93- 99).

4. Results

Table 1: Basic statistical analysis (Univariate Analysis)

Variable	Frequency	Percentage
Does class size affect academic performance?		
No	350	53.0
Yes	311	47.0
Do you do Physics practical in you school?		
No	226	38.8
Yes	357	61.2
Do you do Life-Science practical in your school?		
No	307	52.9
Yes	273	47.1
Do you have a textbook for each subject you are doing?		
No	199	30.0
Yes	465	70.0
Are you shuffled in your school/classes?		
No	497	75.6
Yes	160	24.4
Do you get Awards if you have performed well academically?		
No	272	41.3
Yes	386	58.7

Table 2: Bivariate analysis of students/learners' performance

Variables	0%-49%	50%-100%
Does class size affects academic performance?		
No	198	152
Yes	146	165
(*p-value*=0.028)		
Do you do Physics practicals in your school?		
No	95	131
Yes	233	138
(*p-value* =0.000)		
Do you do Life science practicals in your school?		
No	143	164
Yes	169	104
(*p-value* =0.209)		
Do you have a textbook for each subject you are doing?		
No	92	107
Yes	252	213
(*p-value* =0.036)		
Are you shuffled in your school?		
No	242	255
Yes	99	61
(*p-value* =0.002)		
Do you get awards in your school if you have performed well academically?		
No	129	143
Yes	214	172
(*p-value* =0.026)		

Table 3: Variables in the equation of students' performance- Logistic regression

Variables	B	SE	WALD	df	Sig	Exp(B)
Size	-0.280	0.183	2.335	1	0.127	0.756
Physics	0.563	0.233	5.825	1	**0.011**	1.756
Life Science	0.271	0.216	1.576	1	0.209	1.312
Textbook	0.184	0.197	0.871	1	**0.098**	1.202
Shuffle	0.210	0.225	0.867	1	**0.042**	1.233
Award	0.309	0.185	2.793	1	**0.028**	1.362
constant	-7.60	0.231	10.815	1	0.001	0.468

Table 4: Pass rate of grade 12 learners for the 17 schools

Year & pass rate	Frequency	Percentage
2007		
0-49%	6	35.3
50-100%	11	64.7
2008		
0-49%	3	17.6
50-100%	14	82.4
2009		
0-49%	5	29.4
50-100%	12	70.6
2010		
0-49%	5	29.4
50-100%	12	70.6

Table 5: Qualification of teachers/educators in the 17 schools

Variable	Frequency	Percentage
Master's degree		
Rarely	14	82.4
Often	3	17.6
Honours degree		
Rarely	15	88.2
Often	2	11.8
Bachelor degree		
Rarely	4	23.5
Often	13	76.5
Diplomas		
Rarely	6	35.3
Often	11	64.7
Certificates		
Rarely	2	15.4
Often	11	84.6

Table 6: Regression analysis (OLS)

Source	SS	df	MS	F	Sig
Corrected Model	59.583	5	11.917	6.406	0.000
Intercept	59.111	1	59.111	31.777	**0.000**
Physics	7.048	1	7.048	3.789	**0.003**
Textbook	6.471	1	6.471	3.479	**0.063**
Shuffle	16.023	1	16.023	8.614	**0.052**
Awards	6.303	1	6.303	3.388	**0.046**
Class size	1.984	1	1.984	1.067	0.302
Life science	3.771	1	3.771	2.052	0.153
Error	1043.552	561	1.860		
Total	8321	567			
Corrected Total	1103.136				

Dependent variable: performance (pass rate of gr 12)

Table 6b: Coefficients of learners' performance

Parameter	B (Unstandardized)	SE	Beta (standardized)	T	Sig
Intercept	2.052	0.364	-	5.637	0.000
Physics	0.248	0.128	0.254	1.947	**0.003**
Textbook	0.240	0.128	0.240	1.865	**0.063**
Shuffle	0.418	0.142	0.366	2.935	**0.052**
Awards	0.219	0.119	0.215	1.841	**0.046**
Class size	-0.122	0.118	-0.156	-1.033	0.302
Life science	0.204	0.143	0.210	1.432	0.153

Dependent variable: performance (pass rate of gr 12)

Table 7: ANOVA

Model	Sum of Squares	df	MS	F	Sig
Regression	7.753	6	1.292	5.454	.000
Residual	127.692	539	.237		
Total	135.445	545			

a. Predictors: (Constant), do you get awards if you have performed well? do you do practical in your school?, does the class size affect your academic performance?, do you have text books for each subject you are doing?, are you shuffled in your school?, do you do practical in your school?
b. Dependent Variable: what was the pass rate of Grade 12 in the following past years in your school

Table 1 show that 53% of the students reported that the class size does not affect their academic performance, 38.8% of students do not do Physics practical in their schools because there are no laboratories and 52.9% of the students do not do Life science practical. About 30.0% of the students do not have textbooks for each of their subjects and 43.1% do not get awards from their schools irrespective of how well they perform. Out of the 58.7% of the students who get awards from their schools, some get certificates, some get vouchers, some get study materials (stationary, dictionary, memory-stick (flash drive), etc.) and some get trophies. Other awards include: bursaries, educational fields' trip, school uniform, medals and money. All these awards are meant to motivate the students to keep on doing well because their good work is acknowledged and appreciated. Table 2 gives the results from the cross-tabulation. There is a very strong relationship between performance and availability of laboratories (*p-value=0.000*). Similarly, there is a very strong relationship between performance and a text book (*p-value=0.036*); a strong association between performance and shuffling (*p-value=0.002*), and a strong association between performance and giving of awards. Thus, if students are rewarded for their good performance, they get encouraged and motivated. Furthermore, there is a very strong relationship between performance and the class size (*p-value=0.028*), such that the larger the class size

the lower the pass rate.

Table 3 gives the summary of the analysis by logistic regression. The results confirm that there is a strong association between **Performance and the availability of laboratories for Physics practical,** *p-value=0.011***. T**he logistic regression analysis has confirmed the following: that there is a strong relationship between **performance and awards**, *(p-value=0.028*); **performance and shuffling of students**, (*p-value= 0.042*); but weak relationship between **performance and textbooks,** (*p-value = 0.098*). For the class size, the logistic regression analysis showed no relationship. Similarly there is no relationship between performance and the Life sciences, (*p-value=0.209*).

Mathematically, the model from the multiple logistic regression analysis, can be expressed as follows:

Log odd = -7.60 + 0.563 science practical + 0.309 awards +0.210 shuffle +0.184 textbooks

Implying that

Odd ratio (performance) = 0.468 + 1.756 science practical + 1.362 awards +1.233 shuffle + 1.202 textbooks.

The data were also transformed and; multiple regressions (OLS) and General Linear Modelling were also done as a further confirmation (http//www.ats.ucla.edu/stat/spss/dae/logit.htm; Menard, 1995:43; Hosmer and Lemeshow, 2000:50 - 56).

And the model from these analyses is as follows (see Tables 6 & 6b):
Performance = 2.0652 + 0.248science practical + 0.24textbooks +0.418shuffling +0.219awards***(unstandardized)***

Performance= 0.254science practical + 0.24textbooks +0.366shuffling +0.215awards ***(standardized).***

Table 5 gives the distribution of qualifications of teachers in the sampled schools. Teachers with master's degree were 4.6%; honors degree 6.9%; bachelor's degree 30.0%; diploma 25.4% and a teaching certificate 33.1%. Almost 60% of the high school teachers do not have bachelor's degrees. Most teachers have only a teaching certificate as a qualification.

Discussion: The pass rate for grade 12 in this district, according to this survey, is about 70% (see Table 4) which is commendable since Vhembe is predominantly rural with a high degree of poverty. Many high schools in the district lack good educational infrastructure such as: laboratories, classrooms, more qualified, committed and dedicated staff, textbooks, etc., which promote good performance by students. In 2012 for example, there were some schools in the Limpopo province which did not receive their textbooks until September when the academic year was almost ending. This action prompted a non-governmental organisation (NGO) called, **Section 27**, to take the Minister of the Department of Basic Education to court for various infractions, including: slow delivery of textbooks, non-provision of other resources needed for quality education, lack of commitment to education, and lack of concern for students' plight (*Sunday Times newspaper 1 July 2012, p.5 review*).

Education reflects the broad social, economic and political structure of the country it serves. In South Africa, the past education system for blacks was closely related to the broad development programme and political injustices. Poverty is concentrated in provinces that have a high rural population, which is predominantly Black. Their high poverty is due to their high illiteracy and unemployment levels. These perpetuate the problems that influence poor school performance by the children. Mji and Makgato (2006:259) cite five areas, namely: Teaching strategies; Content knowledge and understanding; Motivation and interest; Laboratory usage; and non-completion of syllabus as direct factors influencing poor performance in high schools. As mentioned earlier, the new government came with a key mechanism to redress the inequality in schools through the distribution of education budget policy that provided the framework for allocating "non-personnel recurrent costs of the basis of need." But it appears the redress formula has not worked

successfully till now. Research investigations on reasons why students do not do well are important because they help to identify the problems that need to be resolved. Some students complain that teachers at high schools are less friendly, always intimidating students with quizzes and competitions, and consequently making students feel less academically prepared. The ensuing fear makes their level of performance drops.

5. Conclusion

From the logistic regression analysis, the explanatory variables for performance are availability of laboratories for science practical, shuffling of students, and recognising and giving awards to hardworking students, which are true at a significance level of 5%; while providing textbooks to students also contributes to poor performance marginally at the 10% level. From Table 6b, the coefficient for the class size is negative (b=-0.122 for the unstandardized) and/or beta (β = - 0.156 for the standardized) confirming that a large class has a negative effect on good performance. Unfortunately the *p-value* shows that the class size has no statistical significance on performance in this instance. In short, the factors affecting the performance of students in high schools in the Vhembe district of the Limpopo province in this study are: availability of laboratories for science practical, shuffling of students in class, giving out awards to good students who excel in their studies and provision of textbooks. Large class size results in overcrowding, making some students inactive, uncontrollable, and some students hiding behind others. Large classes disturb concentration and individual attention for students is also not possible in large classes.

Recommendations: It is believed that this study has provided vital information about how awards or incentive can motivate students to strive for excellence; how much infrastructure available in public schools can contribute to good academic excellence. It has revealed in part the extent to which the attitude to work by both staff and students contribute to success rate. Stakeholders for school administration in Vhembe can look at some of the following recommendations and plan accordingly. This study recommends to the School Management Team and the Department of Education the following: To ensure that teachers identify under-performing students, put them together in one class, (say, class C), and give them extra lessons after hours. Students' support teams should also be formed to help students that may need individual help or extra lessons. Teachers are to be encouraged to give some awards to deserving and hardworking students as motivations and appreciations for their good performance, and that: the governing authority and/or government should endeavour to provide laboratories for practical for relevant (science) subjects. The governing authority and/or government should provide textbooks to schools, especially schools in rural areas; and in good time, immediately when academic year begins, so that serious academic work can start right from the beginning of the year.

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Notes

- Academic is used to describe any exercise that is related to work done in schools, colleges and universities, especially work which involves studying and reasoning rather than practical or technical skills (Collins Advanced Dictionary of English,2009).
- A performance is how successful someone is and how well they do something (Collins Advanced Dictionary, 2009).
- Academic performance refers to how learners/students deal with their studies and how they cope with or accomplish different tasks given to them by their teachers or lecturers.

Academic knowledge brings a person in and ahead of the competitive world and on the surface, someone who is performing well academically is related to the following:

- The ability to study and remember facts, this is something to do with recalling things studied.
- The ability to see how facts fit together and form larger patterns knowledge, this is called constructivism; the ability to come up with new ideas from previous known information with the newly learned ideas.
- The ability to think in relation to facts, and
- The ability to communicate your knowledge verbally or down on a paper.

Good academic performance is linked to having good organisational skills.