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## **Analysis of The Performances of Physics Students Taught by External and Non-External Examiners**

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### **ABSTRACT**

The study aimed at analyzing the performance of Physics students taught Physics by external and non-external examiners considering the influence of gender of students, school location and area of the paper marked by the Physics external examiners. 300 SS3 Physics students were randomly selected from thirty secondary schools spread across Akwa Ibom State. Data generated in the study using the Physics examiners' lists, Physics practical, theory and objective tests were analyzed using t-test, and 2x2x2 Factorial Analysis of Variance (ANOVA). The differences between the performances of students in Physics when they are taught by Physics external and non-external examiners was investigated together with their sections of marking, gender of students and location of schools. The results of the study shows that all the five hypotheses were rejected, that 87% of variations were obtained when they were taught by external examiners in Physics. It was inferred that the performances of students in physics taught by external examiners is higher than that taught by non-external examiners. More physics teachers should enroll to serve as external examiners and attendance of physics teachers in marking co-ordination and actual marking should be made compulsory.

### **INTRODUCTION**

Physics, being a fundamental science course, has numerous applications and constitutes bedrock of development in science and technology in any nation. Achieving proficiency in Physics should therefore, be of a national concern. In our state for instance there has not been a steady trend in the performance of physics students in public examinations

(NECO, WAEC and NABTEB) though there has been a steady increase in the number of students registering for physics in these examinations for the past six years (2000-2005). The online results of WASSCE and NECO SSCE for 2000-2005 revealed the percentage of pass at credit level and above in physics.

**Table 1:** summary of the performances of students in physics 2000-2005 in NECO and WAEC

Academic Years	Credit and above level of pass in percentages (%)	
	WASSCE	NECO SSCE
2000	38	40
2001	42	41
2002	33	38
2003	30	28
2004	40	37
2005	36	45

The pass in physics at credit level and above is below 50% at any particular time in any examination

Out of the physics teachers employed in the State less than 30 % of the teachers are examiners in one or the other examination bodies that we have (SSEB 2000 - 2005).

For the pass six years our students have been performing below average in physics and the percentage of our physics teachers who attended and marked physics in our public examinations is below average too. There has not been recent study to investigate the effect of the low participation of our physics teachers in these examinations. Considering these poor performances of our students in physics in these examinations over the years, it is considered worthwhile to investigate the impact of physics teachers in marking public examinations on the performance of physics students. The purpose of this study therefore, is to assess the impact of physics teachers as external examiners on students' performance in physics.

As observed by Onwioduokit (2004) that not everyone who stands out to teach is a teacher. One can be certified and have some years of post-qualifications experience in teaching, yet not a teacher. But the teacher that is needed for quality education is a quality teacher. While there is need for certification, experience and qualification these alone cannot make for quality. They are rather integral part of quality.

The NPE (2004) states these as the goals of teacher education:

1. Provide teachers with the intellectual and professional background adequate for their assignment and make them adapted to changing situations.
2. Enhance teacher's commitment to the teaching professional.
3. Teachers should be regularly exposed to innovations in their profession.
4. In-service training shall be developed as an integral part promoting teacher education and shall also take care of all inadequacies

In- service training should be made compulsory for teachers. Attendance at workshops, seminars and conference should be fully sponsored and made one of the requirements for a good and quality teacher identification (Onwioduokit 2004). Based on the above views of the NPE and professionals in the field of education it would be seen that attendance at the marking coordination of the different external examinations is one of the major professional requirement of good physics teacher.

At the marking venue, the physics examiners are taught the following:

- i) Qualities of a good test: Validity, reliability and objectivity.
- ii) How to use the marking scheme in marking physics.
- iii) How to detect and discourage examination malpractices and other examination irregularities
- iv) Vetting, grading and handling of examination material including scores.
- v) The physics examiners are also taught the current changes in the nature of answers require in physics examinations.

The knowledge gained by physics examiners during co ordinations marking exercise and the materials gotten during the exercise are useful in preparing students for examination

with an assurance for a good grade of pass. Beside the possible impact of experience received by external examiners it is also observed that gender and location of school has a role in students performance in physics. For instance, Utibe (2003) observed that male students perform significantly better than their female counterparts and that Urban students perform better than the rural students.

It is therefore the aim of this study to investigate the possible influence of external and non-external physics examiners on the performance of physics students in their examinations, vis-à-vis student gender school location and the paper theory or practical marked by the examiners.

## **RESEARCH QUESTIONS**

Answers to the following questions were sought :

1. What difference exists between the performances of physics students taught by physics external and non-external examiners?
2. What influence has gender on the performances of physics students taught by physics external and non-external examiners?
3. To what extent does the location of school influenced the performances of physics students taught by physics external and non-external examiners?
4. What influence has the subject area marked by the examiner on the performance of students in physics?
5. What is the joint influence of gender, location of school and area of the subject (theory and practical) marked by external examiners, on the performances of physics students.

## **RESEARCH HYPOTHESES**

To guide the researchers in the study, the following null hypotheses were formulated and tested:

Ho (i) there exists no significant difference in the performances of physics students taught by physics external and non external examiners.

Ho (ii) there is no significance influence of gender on the performance of physic students taught by physics external and non-external examiners.

Ho (iii) there is no significant influence of school location on the performance of physics students taught by physics external and non-external examiners.

Ho (iv) there is no significance influence of the area of the subject marked by external examiners (practical and theory) on the performances of their students in the Physics, Objectives Test. (POT)

Ho (v) Gender, school location and area of the subject marked by examiners do not have any significant influence on the performance of physics students in their physics tests.

## **RESEARCH METHOD**

This study is an experimental one. Three hundred (SS3) Physics students for 2005/2006 session drawn from thirty out of two hundred and thirty-seven secondary schools in Akwa Ibom State were used for the study. From the thirty secondary schools, fifteen of the randomly selected schools had external examiners in physics and the other fifteen had physics teachers who were not external examiners at any time in the course of their employment.

To ensure a good spread, ten schools were randomly selected from each of the three senatorial districts that made up the state. Ten physics students were randomly selected from each school. The use of SS3 physics students was borne out of the fact that this category of students have completed the SS3 physics curriculum and are ready for the WAEC, NECO and NABTEB examinations and that the knowledge which they gain during the research test would be very useful to them in their final examinations especially those that did not do well in the state mock examination in physics.

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## **RESEARCH INSTRUMENT**

### **Four Research Instruments Namely:**

- i) Physics Examiners List (PEL)
- ii) Physics Practical Test (PPT)
- iii) Physics Theory Test (PTT)
- iv) Physics Objectives Test (POT)

Were adopted and used for the study.

## **ADMINISTRATION, DATA COLLECTION AND ANALYSIS**

Some research assistants were recruited and trained on the conduct of the tests. These assistants were used in all the thirty centers to administer the tests at about the same time under strict examination conditions.

The Examiners Lists contained the names of the examiners, the year they marked, name of schools and location of the school, for easy classification of the schools into urban and rural schools.

The Physics Practical Test and Physics Objective Test has a maximum of 50% and minimum of zero percent each the Physics Theory Test has a maximum of 60% and minimum of zero percent giving a total maximum score of 160% and minimum of zero percent.

The data generated in the study were analyzed using t-test, ANOVA and Factorial Analysis of Variance.

## RESULTS

**Table 2 t-test comparison of means pretest scores of students in external and non external examiners groups.**

Groups	N	Mean $\bar{X}$	SD	Df	t-crit	t-cal	Decision at p< 0.05
External Examiners group	150	79.97	17.24	298	1.96	1.03	NS
Non External Examiners group	150	77.97	20.31				

NS- Not Significant at  $p < 0.05$

From Table 2 the calculated t-value (1.03) is less than the critical t-value (1.96) at 0.05 alpha level indicating that the two groups were comparable.



**Table 3 t-test comparison of means performance scores of physic students taught by external and non external examiners in physics.**

Groups	N	Mean $\bar{X}$	SD	Df	t-crit	t-cal	Decision at p< 0.05
Students taught by external examiners in physics	150	110.3	17.24	298	1.96	10.14	*
Students taught by non-external examiners in physics	150	88.4	20.31				

\* Significant at p< 0.05

From Table 3 mean performance (110.2) of physics students taught by external examiners in physics is higher than (88.4) of the students taught by non-external examiners. The table also shows that the calculated t-value (10.14) is greater than the critical t-value (1.96), indicating a significant difference between the two performances. This therefore implies that physics students taught by teachers who served as external examiners performed better than those who were taught by those who never served as external examiners

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**Table 4 t-test Comparisons of means performance scores of physics students taught by external examiners in physics based on gender.**

Groups	N	Mean $\bar{X}$	SD	Df	t-crit	t-cal	Decision at $p < 0.05$
Male students taught by external examiners in physics	67	120.4	13.6	132	1.96	5.52	*
Female students taught by non external examiners in physics	67	70.8	6.9				
Female students taught by external examiners in physics	83	102.0	15.5	164	1.96	0.24	NS
Male students taught by non external examiners in physics	83	102.6	17.2				

NS-not significant at  $p < 0.05$       \*-significant at  $p < 0.05$

Table 4 shows that the mean performance (120.4) of male students taught by external examiners in physics was higher than (70.8) of their female counterparts that were taught by non-external examiners in physics. The table also shows that the calculated t-value (5.52) is greater than the critical t-value (1.96), indicating a significant difference between the two performances. This therefore implies that male physics students taught by teachers who serve as external examiners performed better than female students who were taught by teachers who ever served as external examiners.

**Table 5 t-test comparison of mean performance scores of students in physics taught by external and non external examiners, giving the location of schools.**

Groups	N	Mean X	SD	Df	t-crit	t-cal	Decision at p<0.05
Urban students with external examiners in physics	92	116.3	16.1	182	1.96	16.64	*
Rural students with non external examiners in physics	92	77.7	15.1				
Rural students with external examiners in physics	58	102.6	14.1	114	1.96	1.14	NS
Urban students with non external examiners in physics	58	105.2	10.4				

NS- not significant at p<0.05    \*-significant at p<0.05

Table 5 shows that the mean performance (116.3) of Urban students taught by examiners in physics was higher than (77.7) of their rural counterparts that were taught by non external examiners in physics. The table also shows that the calculated t-value (16.64) is greater than critical t-value (1.96), indicating a significant difference between the two performances.

This therefore implies that urban physics students taught by teachers who serve as external examiners performed better than rural students who were taught by teacher who never served as external examiners.

**Table 6 t-test comparison of mean performance scores of students in objective physics given the area of paper marked by the physics external examiners who taught physics.**

Groups	N	Mean $\bar{X}$	SD	Df	t-crit	t-cal	Decision at p<0.05
Students taught by external examiners who marked practical physics	75	36.95	5.64	148	1.96	7.99	*
Students taught by external examiners who marked theory physics	75	29.60	5.58				

- Significant at  $p < 0.05$ .

Table 6 shows that the mean performance (36.95) of students taught by external examiners who marked practical physics is higher than (29.60) of their counterparts taught by external examiners who marked theory physics.

The table also shows that the calculated t-value (7.99) is greater than the critical t-value (1.96) indicating a significant difference between the two performances. This therefore implies that students taught by external examiners who marked practical physics performed better than those who were taught by external examiners who marked theory physics.

**Table 7** Summary of 2x2x2 Fractional Analysis of Variance (ANOVA) on the performances of physics students taught by external examiners given school location, gender and area of paper marked by the examiners.

1q	SS	DF	MS	F-ratio	Decision at $p < 0.05$
<b>Main Effects</b>					
Gender	12535.80	1	12535.80	71.45	*
Location	8486.41	1	8486.41	48.37	*
Area of Paper marked	3820.60	1	3820.60	21.77	*
<b>2-way interaction</b>					
Gen x Loc	-4322.12	1	4322.12	24.63	*
Gen x Apm	-2596.05	1	2595.05	14.80	*
Loc x Apm	-578.96	1	578.96	3.30	*
Gen x Loc Apm within	26662.07	1	26662.07	151.96	*
Total	24915.71	142 149	175.46		

- significant at  $p < 0.05$

Gen –Gender of students (male/female) Loc- school location (Urban/Rural) Apm - Area of paper marked by the physics examiners (practical/theory).

As shown in Table 7 gender of students ( $F_{1, 142} = 71.45$ ), school location ( $F_{1, 142} = 48.37$ ) and area of paper marked ( $F_{1, 142} = 21.77$ ) have significant influence on the performance of physics student when they are taught by external examiners.

In the 2-way and 3-way interactions there exists significant influence in all interactions. Since there was an overall significant influence of variables as shown in Table 6 a

Multivariate Analysis (MA) of the factors considered become pertinent. This was to determine which of the factors was most influential.

**Table 8** Multivariate Analysis showing a 2x2x2 Factorial Analysis of Variance (ANOVA) on the performance of physics students taught by external examiners, given gender, school location and area of paper marked by the physics examiners.

Grand mean = 110.52	N	Unadjusted		Adjusted for independent variable and covariates	
Variable category		Dev'n	Eta	Dev'n	Beta
Gender					
Male	68	10.04		8.96	
Female	82	-8.32	0.78	-7.63	0.81
School location					
Urban	93	5.89		4.21	0.86
Rural	57	-9.61	0.91	-8.10	
Area of paper marked					
Practical	76	0.98	0.93	0.12	0.81
Theory	74	-5.11		-3.96	
Multiple R square				=	0.87
Multiple R				=	0.93

Table 8 shows that gender of students, location of school and area of paper marked by the physics examiners have an index of relationship 0.81, 0.86 and 0.81 respectively with a multiple regression index (R) of 0.93 and  $R^2$  of 0.87, it implies that 87% of variations in physics students performances when they are taught by external examiners can be attributed to the joint influence of school location, gender of the students and area of paper marked by the physics examiners.

## DISCUSSION

The findings of this work as shown in Table 3 show that there exist strong significant differences in the performance of physics students when they are taught by external examiners. This implies that hypothesis one and rejected in performance of its alternative. This result is in agreement with the work of Onwioduokit, (2004) who said

that not everyone who stands out to teach is a teacher. The FME (2004) also supports the need for experience as added qualification in effective teaching.

Table 4, shows that there exists a strong significant difference in the performance of students in physics when they are taught by external examiners and non external examiners given the gender of the students. From this result, male and female students who were taught by external examiners in physics performed better than their male and female counterparts who were taught by non external examiners.

Table 5 shows that there exists a strong significant difference in the performances of students when they are taught by physics external examiners and non external examiners given the location of school. From this result urban and rural students who were taught by external examiners in physics performed better than their counterparts who were taught by non-external examiners.

These results for Tables 4 and 5 are in agreement with the provisions of the FME (2004), Onwioduokit, (2004) and Ndure (2006). They all opined that performance depends on the quality of the teacher.

Table 6 shows that there exists a significant difference in the performance of students in Physics Objective Test (POT) given the area of paper marked by the physics external examiners (practical and theory). This implies that students whose physics external examiners marked practical perform better than those whose teachers marked theory physics.

From Tables 7 and 8 it is evident therein that gender of students, school location and area of paper marked by the physics external examiners have significant influence on the performances of students. It also shows that 87% of the variations in students' performance in physics can be attributed to the joint influence of gender of students and other cognitive variables considered in the study. This findings agrees with Utibe (2004); Onwioduokit (2004) and Ndure (2006) whose opinions are that facilities in the teaching

environment should be improved, only quality teachers should be allowed to teach and that examiners should be allowed to handle the certificate class in the school system respectively. It can be inferred from these findings that physics examiners can help in the improvement of the performance of physics students in their external examinations. Based on the findings of this study, it is recommended that the school authorities and the board should make it mandatory that all physics teachers must attained marking coordinations and marked the examinations from time to time. Arrangements should be made in the SSEB to encourage physics teachers to registered and marked in any of the external examinations.

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