

## Assessment of the Effectiveness of Physics Teaching in Senior Secondary Schools, Owerri Education Zone of Imo State

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### Abstract

*This study assessed the effectiveness of physics teaching in Senior Secondary Schools, Owerri Education Zone of Imo State.*

*Descriptive survey research design was adopted. 289 respondents made up of 150 male and 139 female physics students were used for the study. Purposive stratified random sampling technique was used to select the respondents. A forced choice five point likert type questionnaire was used to collect data for the research while mean, standard deviation and t-test statistics were employed to answer the research questions and hypothesis. Results showed that the physics teachers were effective in all the factors of physics teaching effectiveness. They demonstrated greatest effectiveness in knowledge of subject matter and least effectiveness in content coverage. There is a significant difference  $p < 0.05$  between the mean response ratings of male and female effectiveness students in the physics teacher effectiveness in favour of female physics students which shows that they are more favorably disposed to their physics teachers. It is recommended that supervision and inspection of teachers should be a regular exercise by the education authorities so as to maintain and sustain standards.*

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**Key words:** *Assessment, effectiveness, physics, teaching, gender*

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### Introduction

The world is filled with the products of scientific inquiry such that scientific literacy has become a necessity for all. Everyone needs to use scientific information to make choices that arise every day. Also, everyone need to be able to engage intelligently in public discourse and debate about important issues that involve science and technology and deserve to share in the excitement and personal fulfillment that can come from learning and understanding about the natural world. It has been observed, (National Academy of Science, 1996) that more and more jobs demand advanced skills requiring that people be able to learn, reason, think creatively, make decisions and solve problems. These are skills acquired essentially by an understanding of science and processes of science which are now needed in the global labour market. Research by DiaBden, Oni and Adekola (2000) laments that Nigerian graduates lack employable skills. Studies also shows that the state of teaching and learning science and technology in Nigeria is unsatisfactory for the students are seen to acquire certificates instead of acquiring meaningful, useful and marketable skills, (Ugwu, 2005).

It has equally been reported that over the years, students' achievements in various science subjects especially in secondary schools has been consistently deteriorating and is very poor (Ivowi, 1995, Ogunleye 2000, Ugwu 2005, Eniyaju 2010, Obi and Ewuzie, 2014). The interpretation is that the unsatisfactory performances of students in science reflect how much they understand science subjects.

The continual, dismal and poor performance rate is a glaring indication that Nigeria secondary education system is troubled, sick and in a state of decay and requires urgent and full scale reform and improvement. More worrisome according to Obi and Ewuzie (2014) is the fact that the decline in students' performance has become a trend while education authorities are treating it with levity. If this persists, it may deny Nigeria of sustainable economic growth who though at present claims to be the largest economy in Africa.

The declining interest to the study of science on one hand and lack of enthusiasm to take physics course in school or avoiding physics as one of the basic science subjects on the other hand has been an international problem, (Tobias & Birer 1999, Osborne, Simeon and Collins, 1996). Existing research shows that the erosion of students' interest is as early as from lower high school (Hoffman, 2002). The researcher observed that a good number of secondary school students when interviewed, seem to give the impression that they found Physics more difficult and uninteresting than any other subject in the school curriculum.

Physics belongs to the Senior Secondary Science and Mathematical field in the New Senior Secondary Education curriculum structure in Nigeria. Physics deals with matter, energy and the relationship between them. It also deals with physical principles and laws governing the universe. Physics is also the basis of technology and constitutes part of a rational culture. The method of investigation and standards of evaluation in physics in the narrower sense are the essential guidelines for scientific research. Thus, physics remains the theoretical and methodological foundation of the natural science, hence it is popularly called, the pivot of all Science. The study of Physics therefore opens up a broad way to many other disciplines in life that hold the key to scientific and technological development.

In view of the huge roles played by physics in the national development, physics educators and researchers have renewed the search for identifying and understanding the nature and scope of factors that influence learning and achievement in physics. According to Shayer and Adeh (1989) as reported in Ugwu (2005), two major aspects to the difficulties that students encounter in learning physics are the curricular which includes the skills to be taught and the method of teaching them and the group of children to whom the method is to be taught. The nation's education authorities have addressed the curricular by reviewing and introducing a new curriculum for secondary schools in 2011. Having completed and effected change in the curricula, the restructuring for transformation has to be shifted to teaching and learning environment.

Bokova (2014) notes that an education system is only as good as its teachers and unlocking their potential is essential to enhancing the quality of learning. Thus, it seems that more can be done to improve education by improving the effectiveness of teachers than by any other single factor. It therefore appears that teacher's activities and attitudes have a great influence on the achievement of the school education goals. According to Salami ((2006), the role of the teacher in the classroom includes planning, co-ordinating, initiating and organizing programames, teaching, guarding and controlling environment to ensure the achievement of the desired education goals. Thus the teacher is ultimately responsible for translating education policies and principles into actions through interaction with the students. Since the effectiveness and achievement of students in physics is basically influenced by the physics teacher, there is therefore the crucial need to appraise his/her teaching activities and the level of effectiveness in them. Hence, there is the need to assess the teaching effectiveness of the physics teacher.

Another reason is that there is a growing interest in the assessment of teachers' effectiveness occasioned by best practices (Ugwu D & Ugwu G. 2015) and the general agitation by state governments, parents, policy makers and educators calling for improvement and school reform. Thus, interest is fostered by current need for accountability and quality improvement in the teaching profession. Assessment is therefore carried out by summative as a tool to ascertain whether teachers satisfy required standards and formatively as a guideline for professional development.

Again, teachers want and need feedback from their teaching acts for the purpose of diagnosis of students' learning difficulties, improvement and reform effort. It is obvious that people work more effectively, efficiently and persistently while gauging their efforts against results. There is a good agreement (Baid, Fenshon, Gunstone & White 1991) that teachers who are seldom asked to reflect upon their own teaching could be no more than mere repetitors of book material.

Furthermore, assessment of the teaching effectiveness has always been by supervisors from secondary school service commission and ministries of education without any input from students. This research intends to fill the gap by involving students in the assessment of their teachers' effectiveness. This research therefore focuses on measuring those teaching skills that are critical for teacher effectiveness and students' achievement especially in public examinations.

### **Purpose**

There are some factors of physics teaching effectiveness which if not properly investigated may hinder the achievement of the aims and objectives of physics in secondary schools. These factors includes knowledge of subject matter, coverage of content, presentation and development of lesson, use of evaluation skills, managing and control of classroom, personality characteristics and use of the laboratory. The study sought to find out how effective, the physics teacher performs in each of the constructs as perceived by physics students.

It is expected that effective teachers do not only make students feel good about the school and learning but also participate in work activity that result in increased students' performance. The findings from the investigation will help to provide physics teachers with feedback on their own teaching which would help to improve the quality of teaching schools.

It will also provide information on the competence requirements in training physics education teachers. This study therefore intends to improve physics teacher effectiveness, increase achievement and win more students to physics by assessing the effectiveness of physics teaching in secondary schools in Imo State in South Eastern Nigeria. Specifically, the study sought to answer the following research questions and hypothesis.

- RQ<sub>1</sub>** What are the performances of physics teachers in the various factors of teaching effectiveness as perceived by physics students?
- RQ<sub>2</sub>** In which of the various factors do the physics teachers demonstrate greatest teaching effectiveness as perceived by physics students in Owerri Education Zone of Imo State?
- RQ<sub>3</sub>** What is the mean response rating of male students when compared with that of the female students on the various factors of teaching effectiveness?
- H<sub>01</sub>** There is no significant difference  $P(<0.05)$  between the mean response rating of male and female physics students in the various factors of teaching effectiveness.

## Procedure

This study employed a descriptive survey research design. The investigation was carried out during a normal school term and intact classes were used. The sample comprised 289 respondents made up of 150 male and 139 female physics students sampled from a population of 9,087 physics students. The researcher employed purposive stratified random sampling technique to select the respondents from public secondary schools in Owerri Education Zone of Imo State.

The instrument used for the study was a forced-choice five point likert type questionnaires constructed from the various factors of physics teaching effectiveness which includes knowledge of subject matter, coverage of content, presentation of lesson, use of evaluation skills, classroom control and management, personality characteristics and the use of the laboratory.

Each item of physics teaching effectiveness was scored on a maximum of 5 points, 5 outstanding, 4 very effective, 3 effective, 2 fairly effective, 1 poorly effective. The cumulative score of each student gives the score on the factor of teaching effectiveness.

The questionnaire was adapted from the Teaching Practice Assessment form (TPAF) of Alvan Ikoku Federal College of Education, Owerri. The TPAF was modified by the researcher. The researcher administered the questionnaire. They were collected back immediately on completion to minimize loss. The data was subjected to descriptive statistics of mean and standard deviation while t-test statistic was employed to test the hypothesis.

## Results

Three research questions were answered in the study. The research question one is, **what are the performances of physics teachers in the various factors of teaching effectiveness as seen by physics students in Owerri Education Zone of Imo State?**

**Table 1** Mean scores of the performance of physics teachers on the various factors of teaching effectiveness.

S/no.	Factor of teaching Effectiveness	Mean Score	Standard Deviation	Decision
1	Knowledge of subject matters	3.87	0.17	Very effective
2.	Coverage of contents	2.28	0.51	Fairly effective
3.	Presentation of lesson	3.62	0.20	Very effective
4.	Evaluation skills	2.81	0.18	Effective
5.	Classroom control and management	3.01	0.16	Effective
6.	Personality characteristics	3.42	0.17	Effective
7.	Use of the laboratory	2.43	0.26	Fairly effective
	Grand mean	3.06	0.24	Effective

**Table 1** shows that the physics teachers in Owerri education zone of Imo state are effective in all the factors of physics teaching effectiveness as perceived by the students with a mean score of 3.06 and standard deviation of 0.24

Research question two sought to find out in which of the various factors do the physics teachers demonstrate the greatest teaching effectiveness as perceived by the physics students in Owerri education zone of Imo State.

It could be seen from Table 1 that the physics teachers, demonstrated greatest teaching effectiveness in knowledge of subject matter, followed by presentation of subject matters. In both factors the physics teachers were adjudged to be very effective.

Again, the lowest response rating of the effectiveness of physics teachers was on content coverage followed by use of the laboratory, where they were scored 2.28 and 2.43 and standard deviation of 0.51 and 0.26 respectively. They were fairly effective in both factors. Finally, the physics teachers were adjudged effective in evaluation skills, classroom control and management, and personality characteristics.

Research question 3 sought to find out the mean response rating of male and female students on the various factors of teachers' effectiveness.

**Table 2: Mean response rating and standard deviation of male and female physics student on the effectiveness of physics teaching.**

S/N	Factor of Teaching Effectiveness	Male $\bar{x}$	sd	Decision	Female $\bar{x}$	sd	Decision
1	Knowledge of subject matter	3.41	0.16	Effective	4.02	0.18	Very effective
2	Coverage of content	2.01	0.48	Fairly Effective	2.52	0.57	Effective
3	Presentation of lesson	3.43	0.23	Effective	3.85	0.19	Very effective
4	Evaluation skills	2.66	0.16	Effective	2.93	0.19	Effective
5	Classroom control and management	2.71	0.17	Effective	3.28	0.15	Effective
6	Personality characteristics	2.93	0.16	Effective	3.56	0.17	Very Effective
7	Use of the laboratory	2.20	0.24	Fairly Effective	2.67	0.29	Effective
	Grand mean	2.76	0.23	Effective	3.26	0.25	Effective

**Table 2** shows that while male physics students' response rating show that the teachers are effective, the female physics students' response rating also show that they are effective in the factors of effectiveness of physics teaching. The mean response rating scores of male students, 2.76 with a standard deviation of 0.23 is less than the mean response rating of female students' - 3.26 with a standard deviation of 0.25. Thus the mean response rating of female physics students is higher than that of the male students.

Therefore, there is an observed difference in the mean response rating of male and female physics students in favour of the female students. It equally means that the male and female physics students are viewing the teachers teaching effectiveness from different perspective. This may need closer examination in further research.

### Research Hypothesis

**HO<sub>1</sub>:** There is no significant difference ( $P < 0.05$ ) between the mean response ratings of male and female physics students in the various factors of teaching effectiveness.

**Table 3:** Results of *t*-test calculation of the ratings of physics teachers as regards the various factors of teaching effectiveness.

S/N	Factor of Teaching Effectiveness	Male $\bar{x}$	Female $\bar{x}$	sdm	Sdf	df	$t_{cal}$	$t_{cnt}$	Decision
1	Knowledge of subject matter	3.41	4.02	0.16	0.18	287	-30.50	+1.96	S*
2	Coverage of content	2.01	2.52	0.48	0.57	287	-8.23	+1.96	S*
3	Presentation of lesson	3.43	3.85	0.23	0.19	287	-16.94	+1.96	S*
4	Evaluation skills	2.66	2.93	0.16	0.19	287	-14.36	+1.96	S*
5	Classroom control and management	2.71	3.28	0.17	0.15	287	-30.32	+1.96	S*
6	Personality characteristics	2.93	0.16	3.56	0.17	287	-32.31	+1.96	S*
7	Use of the laboratory	2.20	2.67	0.24	0.29	287	-14.17	+1.96	S*
	Grand mean	2.76	3.26	0.23	0.25	287	-17.86	+1.96	S*

Sd = Standard deviation

df = degree of freedom

S\* = Significant at 0.05 probability level

The result in Table 3 shows that the *t*-calculated value for the performance of physics teaching is greater than the *t*-critical value from table at 0.05 level of significance. Since the calculated value for *t* is greater than the table value, it means that the hypothesis which states that there is no significant difference between the mean response ratings in the various factors of teaching effectiveness is rejected.

Therefore the observed difference in the mean response ratings of the male and female physics students is real and cannot be attributed to chance. Thus there is a significant difference ( $p < 0.05$ ) between the mean response ratings of male and female physics students in the effectiveness of physics teaching in Owerri Educational zone of Imo State.

### Discussion

The study assessed the effectiveness of physics teaching in Secondary Schools. The research question one aimed at finding out the degree of effectiveness of physics teaching while research question two sought to determine which of the factors the physics teachers demonstrated greatest teaching effectiveness. From the results of the analysis, the physics teachers were effective in the various factors of teaching effectiveness. They were most effective in knowledge of subject matter and least effective in coverage of contents.

The finding is in line with Stokking and Verloop (2006) study on students' assessment of economics teachers. The students' response rating was 3.12 on average on teacher behaviour which was said to be good performance. This also agrees with the result of an investigation on

the effectiveness of physics teaching in Italy carried out by Cinquini, Robutti, Veneenzi and Violino in 1996. The findings show that physics teaching as seen by the students is not generally negative. The unhappy students do not exceed 27% of the whole sample and 66% feel at ease during lesson and 50% like the subject. According to them, when compared with similar investigations carried out with Vincenzi 1985 whose results revealed that physics teachers seem to be less sensitive to problems within the class but physics teaching is acknowledged as stimulating reasoning. The finding of the research is also in agreement with Anyanwu (2001) who found that religious education teachers performed to a great extent on all the activities in each of the six constructs studied which included lesson plan, teacher presentation of subject matter, evaluation, class control, personality characteristics and religion characteristics.

Furthermore, as regards the present study, since all the students agree that the physics teachers were effective in all the factors of effectiveness of physics teaching what remains is for the students to reciprocate by putting up a corresponding effective performance in their academic work and examinations.

Again, research question three aimed at finding out the mean response ratings of male students when compared with female students in the physics teaching effectiveness.

The finding revealed that male and female students differ in the mean response ratings. The mean response rating of the female students was higher than that of the male students. The result is not surprising because female students are by nature more emotional than the male ones and this difference may have accounted for the observed differences in response ratings of the students (Ugwu D and Ugwu G, 2015). According to Anyanwu (2001) male students are confident, tough and unemotional. Thus, if male students as reported by Anyanwu are tough and unemotional, it is not surprising that they are less liberal in awarding marks to their teachers.

The only hypothesis tested sought to find out if there exists a significant difference ( $P < 0.05$ ) between the mean response ratings of male and female physics students on the effectiveness of physics teaching. From the analysis, the mean response ratings of male and female physics students on the effectiveness of physics teaching differ significantly at 0.05 level of significance. The finding is in line with the finding of Ekpo as reported by Anyanwu (2001) that teacher sex affects the ways in which teachers react to curriculum. However, the result differs from Anyanwu's findings which showed that male and female religious education teachers do not differ significantly as regards each of the constructs studied.

### **Conclusion**

From the finding and discussion it could be deduced that physics teachers in Owerri Education Zone teach the subject satisfactorily to the students, and are dedicated to duty as they are effective in physics teaching. This tends to imply that they are very conversant with the physics curriculum. It could also be concluded that the atmosphere of the school environment is conducive to learning.

Furthermore, the significant difference in the mean response ratings of the male and female physics students shows that the students are examining the effectiveness of physics teaching from different perspectives. Again the significant difference in favour of female students shows that they are more positively disposed to their physics teachers and their teaching than their

male counterparts. This is encouraging for it is arguably important if it translates to attracting more female students to the course vital for socio-economic development of the nation.

### **Recommendations**

The physics teachers should cultivate sustainable characteristics so as to continue to work assiduously in the teaching of the subject for greater students' achievement in examinations.

In order to sustain the trend, stakeholders should ensure that only qualified and experienced physics teachers with high intellectual abilities are recruited into the profession.

It is important as feedback to support the teacher, to release this result to the physics teachers to help diagnose areas of strength and weaknesses for improvement. Also supervision and inspection of teachers should be a regular exercise by the education authorities so as to maintain and sustain standards.

Intermittent seminars and workshops geared towards improving teaching effectiveness of physics teaching should be organized periodically so as to sustain the good performance.

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