

Difficulties Encountered by Secondary School Physics Students in Answering Mathematical Related Physics Questions

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Abstract. *The paper investigated difficulties secondary school physics students encountered in answering mathematical related physics questions in Njikoka Local Government Area, Anambra State. The design used descriptive survey in carrying out this study was descriptive survey, four research questions were raised. The population of the study was all SS2 Physics students from Senior Secondary Schools in Njikoka L.G.A. The schools were stratified into male and female. Five (5) selected Senior Secondary schools for males and three (3) senior secondary schools for females totaling seventy two(72) students of intact classes. The questionnaire was constructed to elucidate answers based on students' factor, teacher factor and Environmental factor. Data were collected through distribution of questionnaire developed by the researcher. A test re-test statistics was used for reliability of the instrument and the co-efficient of reliability was obtained to be 0.89, using Pearson Product movement of correlation. The research questions were answered using Likert's scale of very often (4), often (3), rarely (2) very rarely (1). The study revealed that some students do not have interest in learning physics due to the fact that physics is a difficult and abstract subject. Some are of the view that no matter what they do, they cannot answer mathematical related physics questions. Also it was revealed that Teacher factor, such as method of teaching physics, non-mastery of learning techniques, lack of inquiry method through practicals, personality and experience bring about the inability of secondary school students in answering mathematical related physics questions. Other factors such as environmental and age factors are equally revealed to hinder the ability of secondary school physics students in answering mathematical related physics questions.*

Key words: *difficult, encounter, mathematics, physics.*

1 INTRODUCTION

Physics is one of the science subjects that deals with matter in relation to energy (Okafor, 2010). It seeks to describe how nature operates within a frame work of physical laws which are descriptions of experience and physical theory. Its subject matter ranges from sub nuclear particles to cosmology physically that provides answers to some of the philosophical significant questions asked by the people (Harper and Row, 2013). Science in general with special reference to physics has become an integral part of our lives. Presently, the entire world is filled up with various works of science and these tend to make the lives of the citizenry more comfortable. The practice of science predicted on certain fundamental assumptions which according to Oguniyi (2006) include:

- Space is real and has definite dimensions
- Time is real, continuous and irreversible
- Matter is real and exist within space and time

- Nature is orderly of understanding the nature and phenomena in the universe, countries which today are classified as developed paid some special attention to the teaching of physics. For example, the multitude of curriculum reform programmes which resulted from the challenges of the first human rocket (Sputnik) in 2007, mostly in the area of physics in America, Russia, Britain and other European countries, in contrast, not many developing countries have given any form of priority to physics.

The study of physics has been and will continue to be of tremendous importance to humanity for its ability to explain natural Phenomena and every day occurrences as well as its central role in the world's current technological development (Ikwa, 1997 and Ikwa, 2000). Notable area among others, are in transportation, aviation, medicine, health, human leisure or comfort, agriculture, industry, warfare, peace, information (data) processing and communications (STAN) 1994, Ogunleye, 1996) as in Onwioudnokit and Ikwa (2002). Within the past two decades, each of these areas has witnessed rapid advances and innovations particularly within this global era of computer technology. These pose a lot of challenges for all three categories of persons vis-a-vis physicists, physics teachers and physics educators involved in physics education, physics curriculum development, resource utilization, improvisation, appropriate teaching strategies and the inculcations of positive attitude on learners or students of physics towards mathematically related physics questions.

A physics educator is one who goes beyond physics teaching to researching with possible areas of facilitating instruction in physics (Oguniyi, 2006 and Ivowi, 1999), the research areas include physics curriculum itself – its development and evaluation. There are problems involved in physics education such as insufficient infrastructural and teaching facilities, insufficient manpower, cultural inhibitions, care free attitude of both teachers and learners, poor enrolment of students, low participation of females, wrong perceptions or misconceptions and difficulties students encounter in answering mathematical related physics questions (Ivowi, 1999, Onwioudnokit, 1999).

These and more problems have persisted and hindered progress in the field of physics education in the 21st century in Nigeria. For instance the observed increasingly low performances of students in West African Senior Secondary Schools Certificate Examination and low enrolment (Jegede, Ofuka and Emayeju, Eds, 1992, Adeyegbe 2008 and WAEC 2006 – 2010) point to the fact. Other reasons for the observed trend are overloaded curriculum and poor understanding of mathematical related physics concepts involved due to their "Difficult" nature (Onwioudnokit, 1996, Ivowi, 1999 and NERDC 2014).

In other to reverse this unfortunate situation or trend in keeping with the needs of this millennium, there is an obvious need to adopt a meaningful, dynamic and deliberate strategies and innovations in the teaching of physics. Hence the emergence of this paper on Difficulties Secondary School Physics Students Encountered in Answering Mathematical Related Physics Questions.

1.1 Statement of the problem

The present situation of physics students' performance in Nigeria is not encouraging for several years, and enrolment in physics has been poor among other science subjects (Okafor 2010). A situation where most students take physics as a very difficult subject is something that gives worry to the generality of the populace. Okafor (2010) said that solving mathematical problems in physics is among the problems involved in teaching physics. Therefore a study of this nature is imperative in Nigerian Secondary Schools to determine the

difficulties encountered by secondary school physics students in answering mathematical related physics questions.

1.2 Purpose of the study

The main purpose of this study was to find out the difficulties secondary school Physics students encountered in answering mathematical related physics questions and proffer possible solutions to this problem.

1.3 Research questions

The following research questions were posed to guide this study.

1. To what extent does students' attitude towards physics contribute to their achievement in mathematical related physics questions.
2. To what extent does students' achievement in physics affected by lack of basic mathematical skills.
3. Does physics teacher's method of teaching physics affect students' achievement in mathematical related physics questions?
4. Does student's poor enrolment background contribute to their inability to answer mathematical related physics question.

2 METHODOLOGY

The survey method was adopted for this study. The population of study was all SS2 physics students totaling 144 in Njikoka Local Government Area.

2.1 Sample and sampling technique

The researcher first of all stratified all the senior secondary schools in Njikoka Local Government Area into male and female schools. Five (5) selected from male senior secondary schools and three (3) were selected from female senior secondary schools; thus giving a total of eight (8) secondary schools. Intact classes of SS11 physics students were used giving a total of 72 students.

2.2 Instrument

The instrument used for this study was questionnaire. The questionnaire was designed based on the research questions proposed for the study. The questionnaire was made up eighteen items. All items represent statements to which the respondents responded to on a 4 point modified liked scale, ranging from very often, often, rarely to very rarely. Items 1 – 8 were objective while question 9 was a theory paper. Items 10 – 14 were based on teacher related factor and items 15 – 18 were based on environmental factors. The questionnaire was designed for the general perception on their attitude towards physics, lack of basic mathematical skills, physics teacher's method of teaching, poor environmental background and finally the problem they encountered in answering mathematical related physics questions.

2.3 Validation of the instrument

The question was face validated by five specialists in science education and measurement and Evaluation in Chukwuemeka Odumegwu Ojukwu University (COOU) Anambra State. The specialist approved the face validity of the instrument and endorsed the questionnaire as having content validity after removing items that were found to be of less importance to the study.

2.4 Reliability of the instrument

The reliability of the questionnaire was determined by using the test retest method. The questionnaire was administrated to 15 SSII physics in another school outside the area of study. A two week test retest reliability method was carried out on the respondents. The weeks interval was to ensure that respondents do not remember exactly their previous responses and the items being measured are relatively stable among respondents in order to show consistency in scores in both tests. The scores obtained were correlated and the reliability co-efficient of 0.89 was obtained, thus indicating that the instrument was adequate for the study.

2.5 Method of data collection

The researcher with the aid of two research assistants administered the instrument, so as to ensure orderliness and avoidance of attrition instruction on how to fill the questionnaire followed their distribution. The respondents filled the questionnaire immediately and returned them on the spot.

2.6 Data Analysis

The data generated from the respondents were analyzed by testing the four research questions formulated for the study. Data collected were subjected to analytical procedures using frequency.

Very excited	very often	4
Excited	often	3
Normal	rarely	2
Uninterested	very rarely	1

3 RESULTS

The rating to be used for analysis was outlined as follows:

4	3	2	1
Very excited	Excited	Normal	Uninterested
Very often	Often	Rarely	Very rarely

3.1 Research Question 1

To what extent does students' attitude towards physics contribute to their achievement in mathematical related physics questions?

Table 1a: How do you feel when you have mathematical lesson?

Options	Rating scale	F	Fx	Percentage (%)
Very excited	4	6	24	18.5
Excited	3	9	27	20.8
Normal	2	22	44	33.8
Uninterested	1	35	35	26.9
Total	10	72	130	100

The data of table 1a of above show that 39.3% (51) of the students felt excited when they have mathematics lesson, while 60.7% (79) were uninterested when they have mathematics lesson.

Table 1b: How do you feel when any mathematical physics question is treated in the class?

Options	Rating scale	F	Fx	Percentage (%)
Very excited	4	10	40	27.8
Excited	3	12	39	25.0
Normal	2	18	36	25.0
Uninterested	1	32	32	22.2
Total	10	72	144	100

The data of table 1b of show that 52.8% (76) of the students felt excited when mathematical physics lesson is treated in the class while 47.2% (68) felt uninterested.

3.2 Research Question 2

To what extent does students' achievement in physics affected by lack of basic mathematical skills.

To answer this research question, questions 2a and 2b were used.

Table 2a: How often do you solve mathematical related physics question yourself?

Options	Rating scale	F	Fx	Percentage (%)
Very often	4	6	24	19.2
Often	3	10	30	24.0
Rarely	2	15	30	24.0
Very rarely	1	41	41	32.8
Total	10	72	125	100

Table 2a showed that 43.2% (54) of the respondents often solve mathematics related physics question by themselves, while 56.8% (71) rarely solve mathematics related physics questions by themselves.

Table 2b: How often do you solve mathematical physics assignment given to you by your physics teacher?

Options	Rating scale	F	Fx	Percentage (%)
Very often	4	42	168	70.6
Often	3	15	42	18.9
Rarely	2	10	20	8.4
Very rarely	1	5	5	2.1
Total	10	72	238	100

In table 2b above, 89.5% (213) show of the students very often solve mathematical physics assignment given to them by their physics teacher, where as 10.5% (25) do not solve mathematics physics assignment given to them by their physics teacher.

3.3 Research Question 3

Does physics teacher's method of teaching physics affect students' achievement in mathematical related physics questions?

To answer this research question, table 3a, 3b and 3c were used.

Table3a: How often does your teacher refer you to the physics text book?

Options	Rating scale	F	Fx	Percentage (%)
Very often	4	10	40	29.4
Often	3	7	21	15.5
Rarely	2	20	40	29.4

Very rarely	1	35	35	25.7
Total	10	72	136	100

From the results of table 3a, 44.9% (61) of the respondents show that physics teachers very often refer the students to their physics textbooks, where as 55.1% (75) of the respondents very rarely refer the students to their physics textbooks.

Table 3b: How often do your physics teachers solve mathematical related physics question in the class.

Options	Rating scale	F	Fx	Percentage (%)
Very often	4	5	20	16.9
Often	3	9	27	22.9
Rarely	2	13	26	20.0
Very rarely	1	45	45	38.2
Total	10	72	118	100

Table 3b above showed that 39.8% (47) of the physics teachers often solve mathematical related physics questions in their class, while 58.2% (71) rarely solve mathematical related physics questions.

Table 3c: How often does your physics teacher give you assignment that involves mathematical related physics question?

Options	Rating scale	F	Fx	Percentage (%)
Very often	4	5	20	16.3
Often	3	9	27	21.9
Rarely	2	18	36	29.3
Very rarely	1	40	40	32.5
Total	10	72	123	100

The data of table 3c above showed that 38.2% (47) of the physics teachers often give assignment that involves mathematical related physics questions, where as 61.8% (76) of the physics very rarely give assignment that involve mathematical related physics questions.

3.4 Research Question 4

Does student's poor enrolment background contribute to their inability to answer mathematical related physics question.

Table 4: How do you feel when you have your physics lesson in the class?

Options	Rating scale	F	Fx	Percentage (%)
Very excited	4	8	32	20.2
Excited	3	14	42	26.4
Normal	2	35	70	44.0
Uninterested	1	15	15	9.4
Total	10	72	159	100

Table 4 showed that only 46.6% (74) of the students were excited while 53.4% (85) of the students were just were uninterested, when they have physics lesson in the class.

DISCUSSION

From the analysis and interpretation of data, it was found that student's attitude towards physics is a contributory factor to the achievement in the mathematical related physics question. Their main reason was that physics is an abstract and difficult subject. This is in line with Maduabum and Madubike (2005) who said that mass failure of physics students in West African Senior Secondary Certificate Examination was due to the negative ideologies they have towards physics.

The study also showed that physics students do not have basic knowledge in mathematics. This is due to the fact that most of the students do not attend mathematics lessons because they had already assumed that they must fail mathematics. This finding is in line with the

observation of Obi (2013) who described that most students do not have interest in mathematics as compared to other subjects.

Moreover, the study showed that the students' level of achievements in mathematical aspect of physics is related to the physics teacher's teaching style. Students understand mathematical aspect of physics when they make use of their ears, eyes, hands and brain. This finding is in line with that of Abduhahi (2011) who identified that physics teachers should not be so rigid in their choice of teaching methods but should be practically oriented. It is also in line with Ezemuo (2005) who found that laboratory works form the foundation on which the whole structure of physics is built. This is because it brings students in contact with physical materials and apparatus and gives them the opportunity of acquiring basic experimental skills and techniques.

In addition, the findings of the study showed that majority of the students were uninterested in attending their physics lessons. The reason was that physics is too abstract. The study also finds out that the students should be excited in physics lessons if they are exposed to their physical environment. A student benefits maximally from the learning experiences to which he is exposed. This is in line with Ofoefuna (2010) who pointed out that learners learn most in a conducive environment, such environment should be physically comfortable. In other words, the noise level should be tolerable and legitimate noise distractions are knowledge by the teacher.

Conclusion

The conclusion drawn from this study is that the difficulties encountered by secondary school physics student in answering mathematical related physics question are caused by multi – interacting factors such as student factor, teacher factor, environment factor etc. However the study showed that students' lack of interest in physics and improper methodology of teaching physics as shown by the respondents indicated the difficulties secondary school physics students encountered in answering mathematical related physics questions.

Recommendations

Anambra State Ministry of Education should make genuine effort to ensure that the Physics teachers employed in secondary school have mathematical knowledge in order to ensure students' ability in answering mathematical related physics questions. Physics teachers should always employ the use of theoretical and practical methods simultaneously for teaching and learning at the class-room level, the teacher should try to improvise some teaching materials and laboratory equipment themselves with aid of physics students such as ripple tanks, meter rule, drawing board etc. The following teaching methods should be promoted to enhance the quality of physics education: inquiry approach, project method, computer – assisted technique and mastery learning technique.

Science allowance should be paid to all qualified physics teachers. This will serve as sort of motivation to physics teachers and will be reflected in their being more dedicated to their work.

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BIOGRAPHY

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