Content coverage and students' achievements in secondary school physics: The Delta state example of Nigeria

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Abstract

The consistent poor achievement of students in physics tests and in science generally is one problem attracting researchers because of the danger it poses to the

nation's technological advancement. This work focused on the effect of content thought on students' achievement. Two research questions were put forward which led to the formulation of two hypotheses tested at 0.05 level of significance. Two instruments were designed for the study. They include Physics Content Coverage Rating Scale (PCCRS) and Physics Achievement Test (PAT). The reliability of the instruments was established. The study design is a descriptive survey. The sample of the study consists of 10 physics teachers and 482 Senior Secondary II (SSII) physics students from 10 selected schools in Delta North Senatorial District of Delta State, Nigeria. The findings of the study include among others: an increase in content taught leads to improved students' achievement in both Ministry-made test and a general improvement in Teacher-made test over that of Ministry-made Physics tests. The following recommendations among others were proffered: teachers should be encouraged to attend seminars and conferences to improve their knowledge of the contents they are teaching to avoid deliberate neglect in teaching of some content areas.

Keywords: Content Coverage, Students' Achievement

Introduction

According to Willis (1993), learning is content bound and effective instruction involves breaking topic into a series of small discrete (but hierarchically related) steps. This broken down topics can be referred to as concepts and this will help the teacher to handle (teach) each topic holistically and thoroughly to enhance maximum achievement by the students.

The achievement of students in science in Nigeria has remained consistently poor over the years (Eze 2003; Aprebo, 2003; Betiku 2003; Betiku 2001.). Researchers have explored the effects of teachers' qualification (Etukudo, Elijah and Nnaobi, 2003; Landu, 2003), effects of instructional materials and laboratory (Dareng and Agenda 2002), attitude of teachers and students towards the teaching and learning of sciences (Eze, 2003), the effects of peer group (Briggs, 1995) on students academic achievement.

Though, these researches are quite revealing, the problem still persists. Hence, there is need for more researches and increased implementation of recommendations.

A visit to schools in most Nigerian villages, semi urban areas and even towns and cities reveals a situation where one: (1) Students resume normal academic work after school's resumption. (2) Teachers turning the school into a market by selling goods during school hours. (3) Teachers busy discussing and students loitering on the streets. (4) management either guilty of such offence or not able to enforce punitive measure against such erring staff because of "godfatherism "in developing countries and Nigeria in particular and so on. This is true when students during examinations or aptitude tests confess with bitterness that most of the tasks given were not only difficult but strange to them because they were not taught and this they attribute to their failure as students.

If teaching is not content bound, the science teacher would be happy to pick few areas or concepts well known to him and leave other areas of the concept he may consider difficult and tedious. The negligence by teachers to teach the whole of the stipulated content has led to poor achievement in standardized examinations. For instance, Aworanti and Olakanmi (1997) observed that most teachers of biology seldom teach ecological concepts of biology because they consider it difficult and the consequence is low achievement. Igbokwe (2002) reveal that some teachers concede without any feeling of shame that they do not understand the concept of Mathematics they teach. Betiku (2003) argued that teachers are the main determinants of quality in education. According to Betiku (2003), if they are apathetic, immoral, and anti social, the whole nation will be doomed but if they are ignorant of their disciplines and impact wrong information, they are not only useless but dangerous. Lack of knowledge of a particular concept and negligence to teach because of personal reasons are the two main reasons why contents in schools are not covered. Others include lack of instructional materials to teach some concepts that requires it; public holidays which reduces the study time and so on. Therefore, it is imperative to look at the effect of the discussed abnormalities on students' academic achievement and coverage of expected contents by teachers before external examinations.

Statement of Problems

The problem of this study is the perceived problems associated with the level of contents covered by teachers, especially physics teachers, as it affects the level of Senior Secondary II (SSII) students' achievement in physics. It is yet to be established by researchers whether the students' achievement especially in physics

contribute to their mastery of science subjects and hence their achievement in the final examination. Thus, the work is set out to determine the level of content coverage in the student achievement in physics.

Purpose of the Study

The study is designed to find out whether:

i. There is difference in SSII students' achievement in teacher-made test between schools with high content coverage and with low content coverage in physics.
ii. There is difference in SSII students' achievements between ministry-made test between schools with high content coverage and schools with low content coverage in physics.

Research Questions

To be able to effectively tackle the problem raised above, the following research questions were put forward:

i. Would there be any difference in SSII students' achievement in teacher-made test between schools that have high content coverage and those with low content coverage in physics?
ii. Would there be any difference in students' achievement in ministry-made test between schools that have high content coverage and those with low content coverage in physics?

Research Hypotheses

The following null (Ho) hypotheses were put forward to answer the above stated research questions and tested at 0.05 level of significance.

Ho_1: There is no significant difference in students' achievements in teacher-made test between schools that have higher content coverage and those with low content coverage in physics.

Ho_2: There is no significant difference in students' achievements in Ministry-made test between schools with high content coverage and schools with low content coverage in physics.

Instruments

Two instruments were used for the study:

i. Physics Content Coverageing Scale (PCCRS).
ii. Physics Achievement Tests (PAT).

For Physics content coverage rating scalePCCRS). There are 19 broad topics listed for coverage in the senior secondary (ii) scheme. These nineteen topics had a total of 89 concepts to be considered spanning through the three terms. Each concept were listed in the terms they are to be taught and the teachers were asked to state if each content was either Totally Covered (TC), Partly Covered (PC) or Not Taught (NT). PAT was designed in the form of the exam conducted by the state ministry of education. It contains thirty (30) objective questions and five theoretical questions. The students are required to answer only four from the theoretical and respond to the thirty objective questions.

Research Design

The design of the study is a descriptive survey. The population of the study consists of 7852 senior secondary (SS) II physics students that undertook the Ministry of Education promotion examinations 2004/2005 section and their physics teachers in Delta North senatorial district of Delta State, Nigeria. The actual sample of this study consists of 10 physics teachers and 482 SSII physics students from 10 selected schools. Ten secondary schools were randomly selected and the sampling techniques employed for selecting the schools was the simple ballot.

Validity and Reliability

The two instruments were found valid both in face and content. The Physics Content Coverage Rating Scale (PCCRS) and Physics Achievement Test (PAT) was designed in line with content of SSII curriculum and given to four experts. They

include one lecturer in science education, two in measurement and evaluation and one in physics department. While the experts in science education and physics worked to ensure the validity of the content, the experts in measurement and evaluation ensured the face validity. All necessary corrections and suggestions were taken into consideration in the final preparation of the instruments. The reliability of PCCRS and PAT were established. PCCRS satisfied parallel form of reliability with r = 0.67 while PAT also satisfied parallel form of reliability with r= 0.72 using the Pearson Product Moment Correlation coefficient. The instruments were found reliable and then administered.

The Physics content coverage rating scale (PCCRS) was scored as follows; Total covered content = 2, Partial covered content = 1; and contents not taught = 0. The Physics rating scale had a total of 89 concepts under considerations which amounts to a maximum of 178 points. The level of covered contents was expressed in simple percentage. Also, the t- test of differences was employed to test the hypotheses formulated.

Results

Analysis of Research Question 1

The data was obtained through the use of the questionnaire (PCCRS), PAT and raw scores of students in physics test obtained from the school heads (ministry-made test scores).

From the table, TMPT: Teacher-Made Physics Test. Table1 revealed that School 1 covered more content area (98.38 %) and their students recorded the best achievement (as average of 58.63%). School 10 had their content least covered (52.14 %) and an average achievement of 45.14 %. Schools1, 2, 3, 4, and 5 had their contents more covered and had a corresponding average achievement of 52.68%, while Schools 6,7,8,9 and 10 had their contents least covered with an average students achievement of 36.45%. The table showed that a decrease in students' achievement is the result of a corresponding decrease in teachers' coverage of the contents. From the above descriptive statistics, there is difference in students' achievements in teacher-made test between schools that have content coverage and those with low content coverage in Physics.

Table 1. Showing Contents Covered and Average School Achievement of Students in PAT

Schools	Coverage %	Average scores in TMPT
1	98.38	58.63
2	88.44	55.10
3	78.82	55.09
4	79.44	48.53
5	74.67	46.07
6	67.15	41.40
7	66.67	25.00
8	58.63	39.44
9	57.14	30.75
10	52.14	45.64

Analysis of Research Question 2

Table 2. Showing Contents Covered and Average Achievement of Students in Ministry Made Physics Test

Schools	Coverage %	Average score in MMPT
1	98.38	41.65
2	88.44	41.68
3	78.82	38.22
4	79.44	36.84
5	74.67	25.85
6	67.15	27.94
7	66.67	23.69
8	58.63	27.46
9	57.14	25.84
10	52.14	23.60

From the above, Schools 1,2,3,4,and 5 had their contents more covered (98.38%, 88.44%, 78.82%, 77.44%, and 74.67%) and a corresponding achievement of 41.65%, 41.68%, 88.22%, 36.84%, and 25.85%. schools6,7,8,9, and 10 had their contents least covered (67.15%, 66.67%, 57.14%, 52.14%) with a corresponding students achievement of 27.94%, 23.69%, 27.46%, 25.84%, 23.60%. the schools

with high content coverage had a mean score of 36.85% while those with low content coverage had a mean score of 25.71%. from the mean scores, the schools with high content performed better. From the above analysis, there is a difference between students' achievement in Ministry-made test between schools with high content coverage and schools with low content coverage in Physics.

Test of Hypothesis 1

Table 3. t-test of difference between HCC in TMT

Group	N	Mean	SD	Df	t-crit	t-cal	Decision
HCC	5	52.68	4.65	8	2.306	3.68	Ho_1 rejected
LCC	5	36.45	7.50				

From Table 3 above, N: number of schools under consideration, SD= standard deviation, d= degree of freedom, HCC: schools with higher content coverage, and LCC: schools with lower content coverage. t-crit. (2.306) □t-cal (3.68), the null hypothesis (Ho1) is rejected. Therefore, there is a significant difference in students' achievement in teacher-made test between schools that have high content coverage and those with low content coverage.

Test of Hypothesis 2

Table 4. t-test of Difference between HCC and LCC in MMT

Group	N	Mean	SD	df	t-crit	t-cal	Decision
HCC	5	36.85	5.88	8	2.306	3.6533	Ho_2 Rejected
LCC	5	25.71	1.82				

From the Table 4 above, HCC = schools with higher content coverage, and LCC= schools with lower content coverage. t-crit (2.306) < t-cal. (3.6533). Based on t-cal. (36533), the null hypothesis is rejected. Therefore, there is a difference between students' achievement in Ministry-made test between schools with high content coverage and schools with low content coverage.

Discussion

The issue of qualitative education is all embracing. A student who was thought half or less than half of specified content cannot be said to have obtained a quality education. From the analysis of the data, there exists a general poor achievement across the ten schools in Ministry-made Physics Test. Though the highest is 60%, the average students' achievement in the test is quite low, 31.28% while that of TMT recorded a highest achievement of 96%, the average students' achievement stood at 44% which is also below average. This is quite an improvement in TMT when compared with MMT. In general, there was a better achievement in TMT than in MMT. The null hypotheses raised were both rejected. The result showed that students' achievement in PAT differ significantly between schools with high content coverage and schools with low content coverage. Also, students' achievements in MMT differ significantly between schools with high content coverage and schools with low content coverage. These findings showed that an increase in content covered will lead to improved achievements of students in examinations. These results are in consonance with Aworanti and Olakanmi (1997) and Igbokwe (2002) that observed that failure to teach an aspect of a subject leads to poor achievements in examinations especially external examinations.

Conclusion, Recommendation and Suggestions

Conclusion

From the research, the following conclusions were drawn:

There exist a difference in students' achievements in Ministry-made and teacher-made Physics tests in favour of teacher-made test.

An increase in teachers' content coverage of specified curriculum leads to an increase in students' achievement in both Ministry-made and Teacher-made Physics tests.

None of the ten schools under consideration was able to cover the specified content.

Recommendation for Action

In the light of the findings of this study, the research offers the following recommendations:

i. Ministries and all stakeholders should step-up teachers' supervision to curb lousiness, laziness and sluggishness on the part of teachers to ensure proper coverage of academic schemes.
ii. Teachers should give out the scheme to be covered to enable them read on their own content areas that could not be covered in class.
iii. Teachers should be encouraged to attend an in-service teacher program which include seminars and conferences to improve their knowledge of the contents they are teaching to avoid deliberate failure to teach some content areas.

Suggestions for Further Research

Based on the findings of this study, the following suggestions were offered for further research.

1. This study was carried out in Delta North Senatorial District of Delta State. Similar study should be carried out in other Senatorial Districts and states to confirm these results.
2. The study was carried out in Physics only. This study should be carried out in the other Sciences, Mathematics, Arts, and the Social Sciences to determine if the findings hold in all fields.

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