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COMMUNICATING PHYSICS THROUGH TEACHING MATERIALS: A CASE STUDY OF AKWA IBOM STATE GOVERNMENT SCIENCE COLLEGES

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Abstract

The study aimed at showing the importance of teaching materials on communicating physics. While appreciating the attempts made so far, experimentally, in teaching science in the mother tongue, the paper argues that lack of precision as well as lack of equivalent words in mother tongue for scientific word: among other problems, would not allow such experiments to go beyond the primary school, at the most. It is the thrust of the paper that what is needed most in effective communication of science generally and physics, in particular, is sufficient teaching/learning materials.

Introduction

Communication is very crucial in everyday living. A breakdown in communication is often associated with problems capable of bringing retrogression. On the other hand, a skillful communication facilitates understanding and enhances co-operation. In the same way, communicating science properly facilitates its learning and application.

Physics is known among school students to be a difficult subject. While this may depend on both organismic and external factors, it is worth noting that among subjects that constitute the physical sciences, physics and mathematics (the "ics" subject) need, perhaps, more specialized communication and communicative strategies to enhance understanding and application, than others.

There exist various ways of communicating physics concepts to learners. The most effective of all, perhaps, being through teaching/learning materials. Communication in this way is activity-oriented and is capable of positively influencing all the domains of learning.

Language of Communication

Fafunwa's study, as quoted by Abdullahi (1992) investigated the effects of using the mother tongue in science teaching. The results obtained showed no significant difference between those taught in the mother tongue and those taught in English. Other studies (Oyelaran, 1982; Nwokedi, 1984 and Olarewaju, 1991) support the use of the mother tongue. Onwioduokit (1991), however discouraged the use of the mother tongue isolatedly in science teaching.

The problems associated with teaching science, especially physics in the mother tongue are integrated. First, is the problem of indefiniteness or lack of precision in most mother tongues. For example the word "Energy" is interpreted "Ike" in Igbo, "Odudu" in Efik and "agbara" in Yoruba. 'Ike' in Igbo could stand for power as well as 'human buttock'. There is therefore an ambiguity. Even if 'Ike' is taken as power it is still not precise because energy is different from power. Similar problems occur for other mother tongues. "Odudu" in Efik means power not energy. The same goes for 'agbara' in Yoruba. These tongues do not seem to have equivalent word for energy. Their adoption is bound to

create more problems than the current language of communication does.

Besides, the orthography of most mother tongues in Nigeria has not been fully developed. This will serve as a great impediment to textbook writing in the mother tongue.

Communicating Physics Through Teaching Materials

No matter the language used, the most crucial factor in communicating science generally, and physics, particularly, is the availability and the proper use of teaching/learning materials. Literature is replete with the fact that most Nigerian secondary schools have insufficient materials for science teaching (Ogunniyi, 1977; Ezenbor and Jones, 1986). The most greatly hit by this "monster" are Community Secondary Schools and the area of science mostly affected is physics.

This study therefore sought to empirically establish the relationship existing between the provision of physics materials and students' performance in the subject.

Research questions: The study sought to answer the following questions:

1. Is there any significant relationship between the availability of teaching materials and the performance of students in physics from 1990-1997?
2. Is there any significant relationship between the availability of teachers and the performance of students in physics?

Research Hypotheses: Based on the research questions the following null hypotheses were tested:

1. There is no significant relationship between the provision of materials and the performance of students in physics from 1990-1997.
2. There is no significant relationship between the availability of the teacher and the performance of students in physics from 1990-1997.

Research Method: As a survey study, an ex-post facto research design was used. The sample was made up of all Senior Secondary 3 (SS3) students in the four selected science colleges owned by Akwa Ibom State governments Science Colleges were chosen to ensure comparability in standard. An inventory of materials required in the teaching of physics was drawn up and physics teachers were required to indicate the ones available in the school. The quantity of each available item was also indicated. On the whole 56 items were listed from six (6) areas of physics.

Students' performance were assessed by considering the number of students that had a credit pass or above in physics at the Senior Secondary Certificate Examination (SSCE).

The data generated in the study were analyzed using Pearson Product Moment Correlation.

Results:

Table 1: Total number of materials available per total areas of physics Considered with the corresponding performance of students in all Schools from 1990-1997

Year	School	Mean No. of items for all sections of physics (X_1)	Total of credit passes and above (Y)	Number of Teachers (X_2)
1990	1	218	40	4
	2	65	14	2
	3	28	47	3
	4	32	12	1
1991	1	32	32	3
	2	17	17	2
	3	66	66	3
	4	22	22	1
1992	1	218	70	3
	2	65	24	2
	3	28	58	2
	4	32	21	3
1993	1	218	60	3
	2	65	32	1
	3	28	62	2
	4	32	26	2
1994	1	218	55	3
	2	65	37	2
	3	28	67	2
	4	32	25	2
1995	1	218	63	2
	2	65	41	2
	3	28	54	2
	4	32	26	2
1996	1	218	56	2
	2	65	65	1
	3	47	47	2
	4	32	25	2
1997	1	218	63	2
	2	65	70	1
	3	28	55	2
	4	32	9	1

The most striking observation, as shown in Table 1 is that the materials available in the sampled schools in 1990 were the only ones available throughout the period of the study. There were no new materials. This is very surprising of Science Colleges.

Table 2: Relationship between the provision of materials and students Performance in physics from 1990-1997.

Year	N	$\sum X_1$	$\sum Y$	$\sum X_1 Y$	$\sum X_1^2$	$\sum Y^2$	r	Decision at $P < .05$
1990	56	344.06	113	11367.94	53826.44	4149	0.34	**
1991	56	344.06	137	10673.30	53826.44	6153	0.19	*
1992	56	344.06	173	19178.58	53826.44	9281	0.65	**
1993	56	344.96	180	17789.44	53826.44	9144	0.46	**
1994	56	344.06	184	17127.79	53826.44	9508	0.26	**
1995	56	344.06	184	18800.87	83826.44	9242	0.69	**
1996	56	344.06	193	18606.46	83826.44	10195	0.43	**
1997	56	344.06	207	20496.41	83826.44	12255	0.44	**

$r_{crit} = 0.25$

** Significant at $P < .05$

*Not significant at $P < .05$

As shown in Table 2 above the calculated values of (for all the years except in 1991, are greater than the critical value (0.25). This therefore implies that there exists a significant relationship between the provision of materials and secondary students' performance in physics. Hypothesis one is therefore rejected, except for the year 1991.

Table 3: Relationship between availability of qualified teachers and the performance of students in physics from 1990-1997

Year	N	$\sum X_2$	$\sum Y$	$\sum XY$	$\sum X_2^2$	$\sum Y^2$	r_{cal}	r_{crit}	Decision at $P < .05$
1990	10	10	113	341	30	4149	0.86	0.63	**
1991	09	09	137	350	23	6153	0.66	0.67	*
1992	10	10	173	437	26	9281	0.11	0.63	*
1993	08	08	180	388	18	9144	0.61	0.71	*
1994	09	09	184	423	21	9508	0.32	0.67	*
1995	08	08	184	368	16	9242	0.25	0.71	*
1996	07	07	193	321	13	10195	0.65	0.75	*
1997	06	06	207	325	10	12255	0.37	0.81	*

$r_{crit} = 0.23$

** Significant at $P < .05$

*Not significant at $P < .05$

Table 3 above shows a none significant relationship between the availability of qualified teachers and students performance in physics for all the years, except in the year 1990. Hypothesis 2 is therefore retained, except for 1990.

Discussion and Conclusion

The results of the study emphasize the importance of equipping physics laboratories with appropriate teaching materials as well qualified teachers. For all the years except 1991, a positive relationship was found to exist between materials available and the performance of students in physics (Table 2). This is perhaps because materials have a way of sensitizing students to develop more interest in the subject as well as enhancing cognition and ability to apply the concepts taught. The lack of significant relationship observed for the year 1991 is not readily known.

The more significant relationship between the availability of qualified teachers and students performed

in physics, except for 1992 (Table 3) could be attributed to the fact that with available materials none qualified teachers (those who read pure physics or physics-related courses) could teach physics successfully. This further emphasizes the importance of materials in teaching.

The lack of procurement of new materials for seven years may not be peculiar to the schools used in the study. This is a dangerous trend that should be checked. Government and individuals should assist in providing teaching/learning facilities in physics, considering the role the subject in the scientific and technological development of the nation.

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