

Views of Physics Teachers on the Need to Train and Retrain Physics Teachers in Nigeria (pp. 314-325)

Omosewo, Esther O. - Department of Science Education, University of Ilorin, Ilorin, Kwara State, Nigeria omosewo2k2000@yahoo.co.uk

Abstract

Teacher education is an important enterprise because no education can rise above the quality of its teachers. The number of physics teachers is not as desired in Nigerian secondary schools. Many schools do not have physics teachers (Omosewo and Salami, 2002). For this reason, teachers that were teaching integrated science did not teach the physics aspect of the subject. Therefore, very few students offer physics at the senior school level because physics was strange (since they were not taught at the junior secondary school level) to students. Also, teachers that taught physics at the senior secondary school level could not teach some topics well because they were not taught while at their colleges/universities (Omosewo 2001). One hundred and thirty five physics teachers were sampled in Kwara State of Nigeria on the need for training teachers by giving them questionnaire to fill. The teachers recommended that prospective physics teachers should register for physics courses that they are going to teach at the secondary school level. They also recommended that scholarship should be granted to candidates willing to read physics education in the university and also that there should be in-service training for those on the job. Relevant recommendations are made.

Introduction

Teacher education is a very complex enterprise. The complexity arises as a result of several factors which include: determination of what effective teachers are, teachers are expected to fulfill a variety of roles, some common

to all teachers, others uniquely related to certain kinds of environments or students or subject matter. Added to this, is the fact that teacher education involves the training of professionals who will educate students in future. Despite the complexity in the field of teacher education, one cannot overemphasize the importance of training of teachers of all categories. The efficiency of any institution depends to a large extent on the academic competence of the teaching staff which in turn is predicated on the quality of the education received by the teachers since no educational system can rise above the quality of its teachers (FRN, 2004).

Physics is a branch of science that deals with energy and matter and their interactions. It is sometimes referred to as the science of measurement and its knowledge has contributed greatly to the production of instruments and devices of tremendous benefits to the human race. In Nigeria, physics is being taught as one of the science subject at the senior school level and its branches include mechanics, optics, heat, electricity atomic physics and physics of sub-atomic particles. The importance of physics cannot be overemphasized as it forms the basis for technological advancement of any nation. Its study can lead to several scientific fields and professions such as engineering, manufacturing, mining and construction industries. Also, the knowledge of physics plays a very significant role in the economic development of any nation. As a result of the numerous advantages of physics it has been introduced in Nigerian secondary schools at the senior level in order to achieve the following objectives:

- (i) to provide basic literacy in physics for functional living in the society;
- (ii) to acquire basic concepts and principles of physics as a preparation for further studies;
- (iii) to acquire essential scientific skills and attitudes as a preparation for the technological application of physics; and
- (iv) to stimulate and enhance creativity (Federal Ministry of Education, 185, p.5)

Problems of Physics Education

A major educational objective in Nigeria is self-reliance and this philosophy should be the concern of everybody. Self-reliance is the ability of a nation to provide its essential needs in the two vital areas of the security of the nation and the security of the individual members of the population. The former requires as pre-requisites, a stable political system and practice, an army of

trained citizens who make use of locally manufactured gadgets to act as watch dogs of the nation. It also includes availability to locally manufactured equipment for repelling aerial and marine attacks and for land-based confrontations. In order to achieve a state of security for the individual members of the society, the provision of the basic needs to a functional education, food, shelter and employment is paramount (Omosewo 2005).

Nigeria is yet a long way from a state of self-reliance. There are thousands of personnel of all ranks in our armed forces but a minor fraction of its tools of trade in terms of communication equipment, defensive and offensive weapons is being produced by the nation. Railway development has not been given due attention with the result that mass transportation on land is expensive and it has become more risky to travel on road as a result of ever-increasing rate of accident. First class roads have been built with foreign equipment and the wheeled machinery which travel on them are also foreign manufactured. It is becoming increasingly difficult to import equipment such as bulldozer, grader, low loader, pay loader and so on. The country is not able to produce all the food which she requires for internal consumption, for livestock and for export because she does not manufacture farm machinery nor does she mass-produce machinery for food processing, for preservation and food storage. The creative artisans and metal workers have not progressed in the development of machinery required by industries because local production of the tools such as measuring instruments, hand tools and machine tools which they require for their work has not been properly established. The country (Nigeria) is also lucky to have energy resources such as fossil fuels (coal, petroleum, natural gas, lignite), biomass (wood fuel, agricultural waste and residues), hydro potential, solar energy, wind potential and others such as uranium, geothermal, tar, sand, ocean waves and tides. It is sad that a system of effective exploitation and utilization of those resources for significant betterment of the nation has not yet involved (Omosewo, 2005). The problem hindering the effective exploitation might be many and varied, but a key problem is the evolution of appropriate technologies for the meaningful harnessing and efficient utilization of these resources.

A nation which develops its physics education appropriately may have solution for most of the challenges high-lighted above. The first Russian Sputnik of October 4, 1957 was not only a brilliant scientific feat achieved through an effective science education programme in Russian schools, but it

also shook the world, especially the Americans, out of an apparent educational slumber. It was a firm suggestion to the western world to take a closer look at their educational system and thus to ponder on both its defects and what would be done about them. The launching of the Sputnik could not have been possible if physics was neglected in their science education.

In developing countries, such as Nigeria, where science education receives little or no political support, the most important resource in the physics classroom is the physics teacher. An adequately trained and highly motivated physics teacher can rise above the constraining circumstances of paucity of material resources and government apathy. There is therefore the need for teacher-education to produce self-motivating and effectively trained teachers who will continually seek solutions to problems facing the classroom, those who will initiate changes to improve their teaching and those who will not wait for government or external funding to implement such changes.

Saha (1983) contended that the future of any nation lies in the hands of teachers. According to the researcher, the quality of the present day teachers determines to a large extent the quality of the future citizens of the schools. Also, Chukwuemeka (1985) pointed out that only effectively trained and professional science teachers can be expected to communicate the excitement of science and encourage curiosity in students. Consequently, for a physics teacher to effectively teach in a way that will lead to the development of desirable level of techno-scientific literacy, he/she must be well groomed, be of sound knowledge in physics and he/she must obtain relevant professional teaching qualification(s) along with specialized knowledge of instruction. This becomes necessary in view of the findings that teachers' professional qualifications influence students' academic performance (Wilson and Garibaldi, 1976; Oguntimehin, 1987).

Researchers such as Swan and Jones (1971), Rubba (1981), Abimbola (1986), Ivowi (1983, 1984), Akintola (1985), Soyibo (1985), Otuka (1987), Omosewo (1998, 1999, 2001) and Omosewo and Salami (2002) indicated the need for teachers' academic qualifications in their various subjects. Swan and Jones' (1971) finding was that teachers should receive appropriate training in their subject matter area so that their classroom instruction would be above board. Rubba's (1981) study indicated that teachers have needs according to the science discipline taught. Ivowi (1983, 1984) Akintola (1985), Abimbola (1986) and Otuka (1987) found misconceptions in students which they traced

to misconceptions held by their teachers. Omosewo (1998) found out that senior school physics teachers in Kwara State of Nigeria did not process adequate knowledge to interpret correctly, the performance objectives of the S.S. physics curriculum. Omosewo (1999) reported lack of qualified teachers. Omosewo (2001) found out that teachers that taught physics at the S.S level could not teach some topics because they were not taught while in colleges of Education and universities. Omosewo and Salami (2002) found inadequate physics teachers in the senior secondary school. This is the rationale for the present study. For this study, attempts were made to answer the following research questions:

- (a) What are the views of physics teachers on their exposure to the physics content that they teach?
- (b) What are the views of physics teachers on the need for more physics teachers?
- (c) Are their views influenced by their qualifications?
- (d) Are their views influenced by their experiences?

Hypotheses

The following two hypotheses were tested in these study:

Ho¹ – There is no significant difference between the views of qualified and unqualified physics teachers on the need to retrain teachers

Ho² – There is no significant difference in the view of experienced and less experienced physics teachers on the need to retrain teachers.

Methodology

The study was a descriptive study of the survey type using questionnaire technique. There are sixteen local government areas in Kwara State of Nigeria. There were about 365 senior secondary schools in Kwara State. It was noted that most of the schools were clustered in Ilorin, the state capital. Only 135 schools had physics teachers. Two hundred copies of the questionnaire were sent to schools with the help of research assistants. Only 135 completed copies were returned. The questionnaire was collected on the spot by the research assistant.

The sample for the study consisted of 135 physics teachers randomly selected from 135 schools that had physics teachers. They comprised of 60 university graduates and seventy-five Nigeria certificate in Education (NCE) teachers. Twenty five of the graduate teachers read physics as a teaching subject while the remaining 345 were holders of B.Sc. degrees in Civil, Mechanical and

Electrical Engineering; 12 of them had B.Sc. degree in Geology. Only 15 of the sampled teachers were females. Experience of the sampled teachers were as follows: Sixty five had experience above ten years, 40 of them had between five and ten years while the remaining 25 has teaching experience below five years.

The instrument used for the study was a questionnaire which had two sections; section A contained information such as name of school, qualifications and gender of teachers as well as years of experience of the teachers. Section B required the respondents to rank the six proposals for improving teacher training in Nigerian universities by Omoosewo (1998) in order of seriousness. The instrument was validated by giving twenty copies of the questionnaire to twenty physics teachers in Ogbomoso, Oyo State of Nigeria to fill two times after a time lag of two weeks. Their responses were correlated using Pearson Product moment correlation coefficient formula and a coefficient of 0.87 was obtained. This value was adjudged to be high enough for the instrument.

Result

Four research questions were generated for this study. Two of the questions were answered using frequency counts as well as percentages.

Research Question One:

What are the views of physics teachers on their exposure to the physics contents that they teach?

Using frequency counts as well as percentages, it was found out that 57 percent of the respondents claimed they were not adequately exposed to the physics contents that they teach. According to them, they were not taught while they were in the higher institutions. The result is presented in table 1

Research Question Two

What are the views of physics teachers on the need for more physics teachers?

By the use of frequency counts and percentages, it was found that the sampled teachers indicated an urgent need for recruitment more physics teachers. The result is shown in table 2.

Hypothesis One

There is no significant difference between the views of qualified and unqualified physics teachers on the need to retrain teachers.

By the use of frequency counts, the two categories of teachers were obtained and the hypothesis was tested using χ^2 statistical analysis. The calculated value of 5.3359 as against the critical value at 29.336 at 0.05 level of significance was obtained. The result means that qualification did not influence their views. This is indicated in table 3.

The same exercise was repeated for whether there was need for more teachers or not. χ^2 value of 0.6974 was obtained as against 29.336 at 0.05 level of significance. The result is in table 4.

Hypothesis Two

There is no significant difference in the views of experienced and less experienced physics teachers on the need to retrain teachers.

By the use of frequency counts, the views of the two categories of teachers were subjected to χ^2 test and the following values were obtained: calculated $\chi^2 = 134.9982$, critical value = 29.336. This value is significant meaning that the hypothesis is not accepted. That means that the experienced physics teachers said that their exposure to physics content while in training was not adequate. The less experienced teachers might be afraid to express their views for fear of losing their job. This is shown in table 5.

The same method was used in finding the influence of the teachers' experience on their views concerning the need for more teachers. χ^2 value of 0.6974 was obtained against a critical value of 29.336. This value is not significant. Therefore, the hypothesis which says there experienced and less experiences teachers is not rejected. This is shown in table 6 below.

Summary of Findings

In this study, the following are the major finding:

- (1) Sampled physics teachers claimed that they did not have adequate exposure to physics contents while they were in training.
- (2) Majority of the physics teachers said there was urgent need for recruitment of qualified physics teachers.
- (3) The views of the teachers were not influenced by their qualifications and years of teaching experience.

Discussion of Result

Finding in this study agreed with the concerns of Swan and Jones (1971), Rubba (1981), Omosewo (1998, 1999, and 2001) and that of Omosewo and Salami (2002). Prospective physics teachers should be well grounded in the senior school physics contents. A situation in which what is learnt in the university is hardly reflective of the future encounter of the student is not desirable. Williamson (1969) found out that much of the content and methodology utilized in teaching university courses has little relevance to the day-by-day activities of the secondary school classroom teachers. What was the practice in 1969 is still being practiced in 2007 (38 years gap). For the physics teachers to be effective on their teaching, their training should be relevant to the job that they will do. For instance there is no need for courses in special Theory of Relativity, Low temperature physics, Geomagnetism, plasma physics, radiation physics for prospective senior school physics teachers. Whereas, solid state physics, modern physics, Elementary Instrumentation, Electronics are necessary but physics education students are not usually allowed to offer them (especially electronics). Infact, teaching of physics courses that are not relevant to the S.S. curriculum to prospective physics teachers may be responsible for the easy drift away of supposedly university graduate physics teachers to other sectors of economy. Those who cannot obtain other jobs are just teaching anything to keep body and soul together. For instance, training in medicine offers opportunity for employment in medical field only. In the same way, training in physics education should offer opportunity for employment in the teaching field only. In order words, there should be an obvious disadvantage in going elsewhere to work after training in physics education.

Also, it is not desirable for the country to find holders of NCE (who are supposed to be in the primary school or at best teach integrated science at the junior level of the secondary school), B.Sc. geology and Bachelor of engineering teaching physics at the senior school level. Teaching job should not be for all those who cannot find jobs to be used as stepping stone. In view of the findings of this study, the following are recommended: Prospective physics teachers should be well grounded in the senior secondary physics content in addition to the higher – order physics that they are presently being taught. A situation in which teachers will skip topics in the curriculum will not augur well for the teaching profession. All topics should be taught. If the teachers try to read the topics on their own and teach them it will not be as

effectively taught as if they have been exposed to such topic while in training.

The sampled teachers recommended an urgent need for more qualified teachers, who are not available. Therefore, it is recommended that scholarship should be granted to candidates willing to read physics education in the university.

The teachers that are on the job need to be retrained. If the geologists and engineers that were found teaching physics are not going to their relevant areas, then, they should be retrained either going on study leave with pay for about six months or refresher courses during vacation. In addition to this, such teachers and the qualified teachers should also be made to attend seminars and conferences where they will be exposed to new skills in the teaching profession. These conferences included those of the Science Teachers' Association of Nigeria (STAN) and the Nigerian Institute of Physics (NIP).

In concluding this study, these researchers are of the opinion that Nigeria has the option to choose whether to remain where she is (not yet developed) or to advance. It is not possible to acquire the desired technical know-how without a proper development of the physics education especially at the secondary school level. Physics teaching in the secondary schools in Nigeria can be greatly improved upon by the provision of well trained teachers to execute the designed senior school physics curriculum. As a developing country, we must borrow a leaf from the developed countries that are called developed because of their technical know-how.

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Table 1: Exposure to Physics contents by the teachers

Options	Number of respondents	percentage
Adequately exposed	20	15
Not adequately exposed	77	57
Not exposed at all	38	28
Total	135	100

Table 2: Need for more physics teachers

Options	No of respondents	percentage
Urgent need	132	98
Little need	3	2
No need	-	-
Total	135	100

Table 3: Result of χ^2 test on the views expressed by qualified and unqualified physics teachers on their exposure

Category of teachers	Adequately exposed	Not adequately exposed	Total
Qualified	- (3.7037)	25 (21.2968)	25
Unqualified	20 (16.2963)	90 (93.7037)	110
Total	20	115	135

$\alpha = 0.05$; Calculated $\chi^2 = 5.3359$; critical $\chi^2 = 29.336$

Table 4: Result of χ^2 test on the views expressed by qualified and unqualified physics teachers on the need for more teachers

Category of teachers	Urgent need	Little need	Total
Qualified	25 (24.4444)	0 (0.5566)	25
Unqualified	107 (107.5556)	3 (2.4444)	110
Total	132	3	135

$\alpha = 0.05$ Calculated $\chi^2 = 0.6974$ critical value = 29.336

Table 5: Result of χ^2 test on the views of experienced and less experienced physics teachers on their exposure

Category of teachers	Adequate exposed	Not adequately exposed	Total
Experienced	0 (17.0370)	115 (97.9630)	115
Less experienced	20 (2.9630)	0 (17.0370)	20
Total	20	115	135

$\alpha = 0.05$ Calculated $\chi^2 = 134.9982$ critical value = 29.336

Table 6: Result of χ^2 test on the views of experienced and less experienced physics teachers on the need for more teachers

Category of teachers	Urgent need	Little need	Total
Experienced	107 (107.5556)	3 (2.4444)	110
Less experienced	25 (24.4444)	0 (0.5556)	25
Total	132	3	135

$\alpha = 0.05$ Calculated $\chi^2 = 0.6974$ critical value = 29.336