

Philosophical Relevance of Physics Teacher Education Curricula in South Western Nigerian Universities to Senior Secondary School Physics Curriculum

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Abstract

This study was carried out to examine the philosophy of Physics teacher education in Southwestern Nigeria Universities in line with senior secondary school Physics curriculum. The study adopted a survey research design. The study population comprised all the nine Universities offering Physics teacher-education programme in Southwestern Nigeria and the only Physics curriculum for senior secondary school student by Nigeria Educational Research and Development Council (NERDC, 2009). The instrument used for the study was Philosophical Relevance and Adequacy Checklist (CPRAC). It was used to examine the philosophical relevance of universities Physics teacher education in line with the philosophy of National Senior Secondary School Physics Curriculum (SSSPC). Data were analyzed using frequency counts and percentages. Results of the study showed that out of nine universities selected, three universities (33.3%) had philosophy that is completely relevant to SSSPC philosophical objectives. Philosophies of five universities (55.6%) are partially relevant while that of the remaining 11.1% were poorly relevant to SSSPC philosophical objectives. The results showed the need for the universities to embrace the Philosophy that will meet the need of secondary school Physics students and the society. The study therefore concluded that the philosophy for Physics teacher education programme in Southwestern Nigeria Universities does not meet the demand for teaching Physics in Secondary schools.

Keywords: Philosophy, Curricula, Relevance, Physics, teacher-education, programme.

Introduction

Teacher education is a programme that trains men and women to become professional teachers. It involves making those in training to acquire requisite knowledge in their various subject areas and theories and principles that guide the practice of teaching. Teacher education programme at the University level is based on the provisions for the training of teachers at the tertiary level which were drawn from the National policy on Education (NPE) (FRN, 2004). Faculty of education is expected to produce prospective teachers with proper leadership qualities, knowledge, skills, and attitudes which will enable them to contribute to the growth and development of their communities in particular and the nation in general.

The Education Faculties should produce teachers who have sound mastery of problem solving skills, produce highly motivated, conscientious and efficient classroom teachers for all levels of the nation objective. The Education Faculties are to provide teachers with intellectual and professional background to encourage the spirit of enquiry, creativity, and entrepreneurship in teacher's commitment to the teaching profession and enhance the skills of teachers in the use of new technologies (National University Commission) (NUC, 2007).

In order to achieve the above stated objectives for teacher education as established by NUC, there is a need to train, qualified, efficient and dedicated teachers at the university level, so as to produce teachers to teach the subject (Physics) effectively at the secondary school level (NUC, 2007). Omosewo (2009) noted that the revised version of the NPE (4th edition section 8 subsection 70(a)) stated that teacher education will continue to be given a major emphasis in all the educational planning's since no educational system can rise above the quality of its teachers. The policy also point that if Nigerian universities are to make optimum contributions to national development in professional fields, the course contents should reflect the national requirements.

The same policy under higher education added that:

- a) Education of higher professionals will continue within the university system, and it will be rooted in a broad-based, strong scientific background;
- b) Curriculum will be geared towards producing practical person, and the course content will reflect our national needs, not just a hypothetical standard. Ajeyalemi (2007) also noted that nothing is as important to learning as the quality of the learner's teacher. Physics education is one of the teacher education programmes in Nigerian Universities' Faculties of

Education. Physics is one of the core science subjects taught at the senior secondary school level of the Nigerian educational system. Physics teacher education curricula which were developed in line with the criteria established by the NUC are meant to produce competent Physics teachers (NUC, 2007). The knowledge of Physics is usually required to pursue courses like Astronomy, Geology, Chemistry, Biology, Engineering amongst others. Udoh (2012) established that learning of Physics offers the student an opportunity to think critically, reason analytically and acquire the spirit of enquiry. This is why he asserted that:

Physics is crucial for effective living in the modern age of science and technology. Given its application in industry and many other professions, it is necessary that every student is given an opportunity to acquire some of its concepts, principles, and skills (p. 13).

Despite the importance of this subject, it is widely recognized that the teaching and learning of Physics has been fraught with challenges such as low enrolment both in secondary schools and in tertiary institutions in Nigeria (Daramola, 1982). Notable among the causes for low enrolment of students offering Physics in schools include: poor Science and Mathematics background of students at the junior secondary level of education, poorly equipped Physics laboratories, inadequate motivation of teachers, poor remuneration, inappropriate teaching strategies employed by the teachers and insufficient number of qualified Physics teachers (NERDC, 2009; Jegede and Adedayo, 2013). These factors have equally added to decline in performance of students who enrolled for Physics at the Senior Secondary School Certificate Examinations (SSCE). This is evident in the West African Examination Council (WAEC) results between 2010 and 2015 as presented in Table 1.

Table 1: Trends in Students' Performance in Physics in the May/June West African Senior Secondary Certificate Examination (WASSCE) (2002-2011)

Year	Subject	Total No. Candidates	No. of Credit Pass	% Pass	No. of Fail	% Fail
2010	Physics	487,963	159,264	32.64	328,699	67.36
2011	Physics	587,772	157,543	26.80	430,229	73.20
2012	Physics	324,998	126,131	38.81	198,866	61.19
2013	Physics	298,971	86,612	29.17	212,359	70.83
2014	Physics	241,161	72,522	29.27	168,639	70.73
2015	Physics	529,425	165,604	31.28	363,820	68.72

Source: West African Examination Council, Research, and Statistics Unit 2015

In 2010 out of 487,963 students that enrolled for this subject, only 32.64% of the students had a minimum of credit leaving 67.36% scoring below credit. In 2011, 587,772 students enrolled while only 26.08% had a minimum of credit leaving 73.20% failing the examination. These as being like that till 2015 results. It also implies that only a few students would eventually be able to pursue Physics related careers in higher institutions. This will consequently have great implication on manpower development in Engineering and other related professional fields.

This decline in performance of student in secondary school Physics has brought great concern among researcher, scholars, and examination bodies. A number of related studies have been carried out by Nigerian researchers in science education (Ajayi, 2000; Mankilik, 2006; Ajayi, 2007; Ibidapo-Obe, 2007; Abdulraheem, 2012; and Bilesanmi-Awoderu, 2012) on issues such as teaching methods, classroom interaction pattern, curriculum evaluation and implementation, conception of electromagnetic field held by college students in Nigeria and the challenges of teacher in Nigeria but yet with little improvement in the performance of the students in Physics.

There are currently on-going debates, controversies, and doubts about the quality and performance of university graduates in different social, economic, and educational institutions.

In education, these doubts find some justification in the failure of university graduate teachers in Physics education to implement the national Physics curriculum satisfactorily as expected (NERDC, 2004). The policy emphasized the curriculum that: curriculum represents the total experiences to which all learners are to be exposed to the contents, performance objectives, activities of both teachers and learners, teaching and learning materials.

This failure is partly attributed to the observed/recorded student's failure in some core science subjects like Physics. While both teachers, the students and the university system share some of the blames in the failure. Literature has shown evidences of knowledge about relevance of Physics education programme of Nigerian higher institutions to the teaching of senior secondary Physics (Omosewo, 1991). A review of the few existing literature in advance countries suggests that the philosophy of the curriculum at universities and secondary schools are fundamental to improving the quality of university graduates teaching in secondary schools and that this quality is likely to be reflected in the performance of the students they teach. Philosophy in curriculum development serves as a guide towards the implementation of the curriculum. It fosters the worth and development of the individual, and the general development of the society. Omosewo (2009) agreed that educational philosophy should be the concern of everybody. Each discipline has its philosophical statement backing the respective programme.

One of the tasks of philosophy in curriculum studies is the mapping of the logic of relationships and relevance of the core elements in curriculum development and instructional delivery. It clarifies the meaning of concepts and their relationships and articulate such relationships in the process of both the structuring (Organization) of curriculum and its implementation (Ehinder, 2014). The objectives of the study dictate a conceptual framework that can account for the diversified structure of the secondary school curriculum and the specialist nature of the university courses. Such philosophical and theoretical positions may account for the diversified and specialist structures of the secondary school and universities curricula respectively. Therefore, this study is based on the conceptual framework of egalitarianism and utilitarianism. Both egalitarianism (progressivism) and utilitarianism (instrumentalism) become philosophical framework from which theoretical constructs of curriculum structures and elements are organized into the various programmes and courses implemented by different departments and faculties.

Consequently, egalitarian philosophy leads to a form of broad-based liberal education for which a diversified curriculum at the secondary school level is structured to accommodate. Egalitarianism is viewed in terms of social equality (Peters, 1974). Coleman (1968) viewed egalitarianism as being formal procedural, process and achievement which generally sound for the notion of equity. Operating at the base of the Nigerian education, egalitarianism is an adequate and appropriate education which is comprehensive (eclectic) to meet the needs of secondary school education as stipulated in the Revised National Policy on Education (FGN) (FRN, 2004, 2007). Therefore, the curriculum under this situation most especially Physics as subject in Nigeria secondary school must be taught by competent graduate teachers undergone training under a unified philosophy meet the needs of the society. Therefore, objectives of the study pointing to the relevance of philosophical objectives are embedded in the utilitarian and egalitarian philosophy. It tends to examine the relationships among disciplines. In view of the foregoing, it is quite clear that issues of the training received by Physics teachers in their various Universities call for the study of what is taught in Physics in the universities relative to the philosophy used to implement Physics teacher education programme in Southwestern Nigeria. There is therefore, the need to examine the programme across Southwestern Nigerian Universities.

Statement of the Problem

Physics education is one of the teacher-education programmes in Nigerian universities' Faculties of Education. Such Physics teacher- education curricula which were developed in line with the criteria established by the National University Commission (NUC, 2007) are meant to produce competent teachers for senior secondary school Physics teaching. The poor performance of students in Physics may be as a result of poorly equipped laboratories, inappropriate teaching strategies, and insufficient number of quality teachers produced from one university or another. This may question the standard of such curricula and their processes of implementation in the faculties of education. Studies have been carried out on issues relating to teaching methods, classroom interaction pattern in Physics classrooms, curriculum evaluation, and implementation in Nigeria but yet with little improvement in enrolment and performance of Physics students (Ajayi, 2000; Mankilik, 2006; Ajayi, 2007; Ibidapo-Obe, 2007; and Abdurraheem, 2012).

Therefore, there is a need to examine the programme across the universities by examining the existing gap in the underlying philosophy in Physics education to that of senior secondary school Physics curriculum in Southwestern Nigerian. Hence, this study.

Purpose of the Study

This study examined the philosophy of Physics teacher education curricula in Southwestern Nigerian universities with respect to senior secondary school Physics philosophy.

The specific objective of the study is to:

- Determine the relevance of the philosophy of PTEC in selected southwestern Nigerian universities to the senior secondary Physics curriculum.

Research Questions

- How relevant is the philosophy of PTEC of each selected Southwestern Nigeria universities to the senior secondary school Physics curriculum?

Methodology

The research adopted survey research design. The population for the study comprised all the Physics teacher education curricula in Southwestern Nigerian universities and the senior secondary school Physics curriculum. All the nine universities offering the programmes in the selected area were used for the study. The study sample consisted of all the nine Physics teacher education curricula and one senior secondary school Physics curriculum was purposively selected for the study. These are because they are the accredited and approved document by NUC and NERDC respectively.

Research Instrument

The research instruments developed for this study is:

- Physics Teacher Education Curriculum Philosophical Relevance and Adequacy checklist (**CPRAC**)

CPRAC was developed by the researcher to elicit information about the philosophical objectives of universities curricula with regard to their relevance and adequacy in line with established NUC PTEC philosophical objectives. Philosophical objectives of NUC for Nigerian physics education programme were listed and grouped under learning acquisition (AQ) and learning application (AP). Sections A consist of items on deskwork table with a two dimensional table showing NUC versus each university's philosophical objectives. A 2-point categorical scale of 'Relevant' (R) and 'Not Relevant' (NR) was used. Percentage of each score was collated and compared for relevancy of the PTEC to NUCBMAS. Section B is a table with a modified 2-point categorical scale of 'Adequate' (A) and 'Not Adequate' (NA) which are respectively scored 2 and 1 to ascertain the degree of philosophical objectives among the sampled universities in Southwestern Nigeria. Similarly, 'Relevant' and 'Not Relevant' were also scored 2 and 1 respectively.

The decision rule is that items that scored 60% and above were regarded as been available and adequate while those scored below 60% were not available and adequate. This agrees with Odike (2008), who stated that a percentage of 60% and above in the response of the respondent to an item should be considered and appropriate and relevant in taking decision in any task. Section C1 and C2 try to compare between four itemized philosophical objectives of senior secondary school Physics curriculum with the various universities in Southwestern Nigeria. The response used in the table were 'Relevant' and 'Not relevant'. Similarly, C1 and C2 sought information on the relevance of the universities philosophical objectives in terms of content, societal needs and individual development respectively. The responses were scored and analyzed using percentages. The decision rule is that items that scored 60% and above were regarded as been available and adequate while those that scored below 60% were not available and adequate. This agrees with Odike (2008), who stated that, a percentage of 60% and above in the response of the respondent to an item should be considered and appropriate and relevant in taking decision in any task.

Validation of Instruments

The instrument CPRAC was validated through expert judgment for both face and content validity.

These was done by two curriculum evaluation experts, two science educators in the Department of Science and Technology Education, Obafemi Awolowo University, Ile-Ife, two experienced Physics lecturers in the Faculty of Science of the same university and six experienced Senior Secondary School Physics teacher.

Data Analysis

Analysis was done using non-parametric descriptive statistics (frequency counts and percentages). These were used to answer the research questions.

Results

Research Question: How relevant is the Philosophy of Physics Teacher Education Curricula to the Senior Secondary School Physics Curriculum (SSSPC)?

In order to answer this question, a Content Analysis (CA) was used to analyse the four objectives of SSSPC against philosophical objectives of each of the selected universities in Southwestern Nigeria for relevance using CPRAC. Each university philosophical objectives were viewed against the secondary school Physics philosophical objectives and this was coded as “Relevant” or “Not Relevant” for the purpose of the analysis. The result is as presented in Table 2.

Table 2: Relevance of Philosophy of Physics Teacher Education Curricula (PTEC) in Selected Southwestern Nigerian Universities to Senior Secondary School Physics Philosophical Objectives

Universities	Frequency of Relevance	Percentage Relevance	Frequency of non relevance	Percentage of non relevance	SSPC objectives not Incorporated in UPTEC
A	3	75	1	25	Stimulate and enhance creativity(4)
B	4	100	-	-	Relevant
C	3	75	1	25	Stimulate and enhance creativity (4)
D	3	75	1	25	Acquire basic concepts and principles of Physics as a program for further studies (2)
E	3	75	1	25	Acquire basic concepts and principles of Physics as a program for further studies (2)
F	3	75	1	25	Stimulate and enhance creativity (4)
G	3	75	1	25	Stimulate and enhance creativity (4)
H	4	100	-	-	Relevant
I	4	100	-	-	Relevant

Source: UPTEC of some selected universities in southwestern Nigeria, NERDC.

Table 2, shows that the focus of teaching Physics in secondary schools is to (i) provide basic literacy in Physics for functional living in the society, (ii) acquire basic concepts and principles of Physics as a preparation for further studies, (iii) acquire essential scientific skills and attitudes as a preparation for technological application of Physics and (iv) stimulate and enhance creativity. The philosophy here is both child and society centered. Using frequency counts as well as percentages, as presented in Table 2, it was found that, out of the four philosophical objectives of senior secondary school Physics presented by Federal Ministry of Education, University (H), University (I) and University (B) philosophical objectives are at 100% relevant with all the four items. University (C), University (A), University (F), University (D), University (E) and University (G) philosophical objectives are at 75% relevant to the four items. The University C, A, F and G philosophical Objectives are seen as not relevant in the areas of stimulating and enhance creativity.

On the other hand, University D and E philosophical objectives are not relevant in the area of acquiring basic concepts and principles of Physics as a program for further studies.

Discussion

Each university in Southwestern Nigeria is supposed to have a unified philosophy as established by NUC for PTEC so as to produce qualified and adequate teachers that are equipped to teach physics in secondary schools. Conversely, philosophy which is supposed to be a guide to PTEC in most of universities had not been seen as relevant to the needs and aspirations of the people of Nigeria. This is why Monk and Osborne (1996) supported the need to restructure science by placing the philosophy as a guide to a discipline for relevance. It could be deduced from the Table 2 that the six universities with the deficiency in their philosophical objectives did not fully meet up with the demand and aspiration for self development in the society if the two items are not incorporated in their curricula. Universities philosophies for PTEP are supposed to be strictly unified so as to achieve the purpose of teaching Physics in secondary schools. This study has established that the philosophy for Physics teacher education in most of the selected universities in Southwestern Nigerian is not relevance to the senior secondary school Physics curriculum. The National Policy on Education (FRN, 2004) emphasized on the self reliance and development of society which are the basic reason for an egalitarian philosophy for secondary education.

No country will develop technologically without citizen with creative mind. The pre-service teacher training in the universities are supposed to embrace creative learning. This will enable them to teach creatively and apply the basic concepts and principles of Physics to arouse the creativity minds of the students at secondary school level. The research resulted into the need to introduce and review the current Philosophy of Physics education in the various universities in Southwestern Nigeria. Ivowi (1987) reported the need to incorporate history and philosophy of Physics to Physics education programme so that the prospective to be teachers will be able to approach Physics teaching with some humanistic approach which will in return arouse the interest and performance of the learners. Furthermore, looking at the prospective and practicing secondary school science teacher's knowledge and beliefs about the philosophy of science, to provide a salient reminder that, for Physics teachers, physics is perceived as an established body of knowledge and techniques that require minimal justification. He then suggested that physics teachers should realize the inclusion of philosophy of the subject.

Conclusion

The study concluded that the philosophy, structure and the implementation strategies of Physics teacher education curricula (PTEC) in selected Southwestern Nigerian universities are not adequately observed by universities curriculum developers. A reasonable conclusion one can draw is that NUC policies (NUCBMAS) have been clear and consistent over the years and there is a well-designed curriculum for PTEP by NUC aimed at satisfying the needs of the society especially at the secondary school level, but if we are to go by the findings of this study and assessment of the Physics teachers produced, one can say that the efforts in implementing the NUC standard have not been enough to produce the desired results.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Each university should ensure that its philosophy is relevant to senior secondary school Physics curriculum
2. All universities training secondary school Physics teachers, particularly faculties of education, should cooperate to produce common curriculum guideline as established by NUC for the Physics components of the teacher education programme so as to ensure a uniform preparation of teachers for the same secondary school Physics curriculum.
3. The PTEC of various universities should include the philosophy that emphasized creativity, acquisition of basic concepts and principles of Physics for further studies in their programme.

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