

# Assessing the Impact of Professional Development on Physics Tutors' Knowledge about the National Teachers Standard and the new Teacher Educational Curriculum Framework in Ghana

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**Abstract:** - The purpose of this study was to find out the perception of the physics tutors about the impact of a continuous professional development on their knowledge about the national teachers' standard, the national teacher education curriculum framework and the 4-year B. Ed curriculum. The study employed descriptive cross sectional survey using an online survey. The population for the study comprised all colleges of education tutors who teach physics. In all 85 tutors took part in the online survey. The data collected was analysed using means, standard deviations and ANOVA. The results indicated that the professional development has had great impact on teacher's knowledge about the national teachers' standard, the national teacher education curriculum framework and the 4-year Bachelor of Education curriculum. It was also found that there was no statistically significant difference in the impact of the professional development based on tutors' qualifications. Implications of the study for practice are drawn.

**Key words:** professional development, teachers' knowledge, physics, national teachers' standard

## I. INTRODUCTION

There is evidence that effective professional development activities can help in deepening the knowledge level of teachers and can result in improvement in their teaching practice [1]. There are varied goals for organizing professional development programme for teachers [2]. Some are organized to produce transformation in attitudes, beliefs and perceptions of teachers [3;4]. Educational reforms and school improvement programmes demand professional development. This is because there is rapid growth of knowledge in all fields of education which requires new expertise so that teachers can be abreast with emerging knowledge. Also, reforms in education demand that teachers and administrators change their roles to take up fresh task. Professional development is therefore needed by teachers and administrators in order to understand these roles and perform well [2]. Professional development is very important when it comes to bridging the gap between the initial teacher training and educational reforms. It is a key focus for educational improvement [5]. Many institutions therefore spend a lot of resources in providing professional development to ensure

consistency between teaching and institution's vision [6]. Professional development can boost teachers' confidence, provide them with opportunities to learn and apply new skills and improve their pedagogical knowledge [7].

Despite the importance of professional development, there are those who see the increased need for professional development as indicating a weakness in teachers' skills and knowledge. The emphasis on professional development does not indicate deficiencies in knowledge but recognition of the fact that education is a dynamic professional field [3]. Guskey [3] posits that professional development is considered by many teachers as having little impact on their work. It is regarded by some teachers as a waste of time as it has not always yielded the expected results [4] but they do attend to it to satisfy "contractual obligations". Despite this view, professional development is the key for teachers to be abreast with the increasing knowledge in the field of science and technology. Policy makers believe that when science teachers are given the needed learning opportunities they can train their students for the 21<sup>st</sup> century [2].

A national effort is on-going to transform and upgrade teacher educational programmes in Ghana to produce high quality teachers for the country. The past two decades has seen minor reforms in teacher education in Ghana but without much impact on children learning outcomes [7]. The Government of Ghana has aimed at overcoming the poor learning outcomes and identifies teaching both as a hindrance and solution to that progress [8]. It has therefore instituted a four-year programme called Transforming Teacher Education and Learning (T-TEL) with the financial support of £17 million from the UK government which is aimed at transforming the pre-service teacher education in Ghana by improving the quality of teaching and learning in the country.

In view of the reform in teacher education in Ghana, ongoing professional development sessions have been instituted for the tutors of the colleges of education. T-TEL provides support for the college based professional development of the tutors. This is a weekly professional

development session which is organized in every semester to improve teacher knowledge and skills. The programme which was started in 2015 has been sustained till now. The professional development has focused on classroom practices. But with the recent change in the colleges from the Diploma Awarding to Degree Awarding institutions, another dimensions of the professional development session have been added which are aimed at helping tutors to understand the National Teachers Standards (NTS) and National Teacher Education Curriculum Framework (NTECF) and to also prepare them for the delivery of the 4-year Bachelor of Education (B. Ed) Curriculum. The programme is organized by specially trained college tutors who are known as professional development coordinators.

According to Bill and Melinda Gates Foundation [9] a whopping sum of \$18 billion is spend on teacher professional development annually yet this investment does not yield the expected results. Teachers describe many professional developments they receive as irrelevant, ineffective and having no bearing on their core mandate of helping students learn [9]. Policy makers continue to search for evidence of its impact on teachers since so much resource are expended on professional development [10]. But not all professional developments lead to improvement in the effectiveness of teacher quality [11].

The key question that policy makers must ask is how effective is the professional development or what impact did it make? In most cases, these questions are not asked by the policy makers and “professional learning and development performs an essentially reproductive role rather than offering transformative possibilities” [12, p.1].

According to Guskey [3] teachers’ perception has influence on professional development implementation, if teachers perceive that the ideas, practices and skills emphasized in professional development are likely to increase their competence and effectiveness, they will accept – and practice them. It is therefore important that teachers’ perceptions are considered in studies of professional development as Fullan [13] posits that the ways teachers think and do things affect changes in education. This study therefore sought to find out the perception of the physics tutors about the impact of the professional development on their knowledge of the NTS, NTECF and the 4-year B. Ed curriculum.

The study was guided by the following research questions and hypothesis

1. What is the perceived impact of the professional development on physics tutors’ knowledge about the National Teachers Standard and National Teacher Education Curriculum Framework?
2. What is the perceived impact of the professional development on physics tutors’ knowledge about the 4-year Bachelor of education curriculum?

This hypothesis was also formulated and tested at .05 level of significance:

Ho: There is no statistically significant difference in the perceived impact of the professional development by the physics teachers based on their qualification.

## II. LITERATURE REVIEW

This section of the study review literature on professional development that relate to the problem understudy.

### 2.1 *Impact of Professional Development*

The impact of professional development programmes to the science teacher lead to the following outcomes; teacher ability to adopt teaching to need of different students, increase content knowledge and pedagogical content knowledge and improvement in teaching practice [14]. Teacher professional development can have an influence on teachers’ learning, instructional practice and student learning [10]. The impact of any professional development depends on how well motivated the teachers are to learn and change their practice. If teachers are not motivated they will not resist the programme but they will forget about the ideas learnt in professional development when they go back to their classrooms [15].

A survey conducted by the Bill and Melinda Gate Foundation [9] on implementing effective professional development involving 1,300 teachers and other stakeholder of education revealed that there is a disconnect between the professional learning that decision makers intend and what teachers actually experience. It was shown that just 29% of the teachers are satisfied with the professional development currently being offered with majority of the teachers believing the professional development is not helping to train them for the changing nature of the teaching job especially in the area of technology. The research also identified that professional developments provided by educational leadership are not satisfying the demands of the teachers.

### 2.2 *Impact of Professional Development on Teachers’ Knowledge and Skills*

According to van Driel et al. [4] professional development can have an effect on teacher’s cognitions (i.e. their knowledge, beliefs and attitudes). Most professional development programmes are design to enhance teachers’ knowledge and classroom practices. Guskey [3] posits that “what attracts teachers to professional development, therefore, is their belief that it will expand their knowledge and skills, contribute to their growth, and enhance their effectiveness with students” (p.382). Professional development in science can produce positive and lasting changes in teachers’ knowledge and beliefs and instruction [14]. Studies show a positive relationship between professional development and teachers’ knowledge and skills [17;18;19]. In an experimental study of science teachers’ professional development programme, involving 125 teachers and 1676 students, Price

and Chiu [20] found that teachers in the experimental gained 7% content knowledge than their counterpart in the control group.

Heck et al., [18] and Banilower et al., [17] investigated the relationships between professional development and teachers' attitudes and teachers' knowledge. They used teachers' self-reported survey data to measure the relations. Using Hierarchical Linear Modelling (HLM), the researchers found that the total number of hours the teachers spent participating in LSC projects was directly related to their attitudes towards both standards-based teaching and their perceptions of pedagogical and content preparedness.

Penuel Fishman, Yamaguchi and Gallagher [19] examined the relationship between professional development and teachers' knowledge. They defined teachers' knowledge as teachers' knowledge of pedagogy, which includes both content knowledge and pedagogical content knowledge. They used teachers' self-reported survey data to measure this knowledge. Using Hierarchical Linear Modelling (HLM), the results showed that teachers' perceived coherence of earth science education programs had a positive correlation with their pedagogical knowledge.

### 2.3 Professional Development and Teacher Background Characteristics

A relationship between professional development outcomes and teachers background characteristics such teachers experience and qualification must be taken into consideration when planning, implementing and evaluating professional development [18] Teacher characteristics include their prior experience, content knowledge, beliefs, and attitudes [21].

A study was conducted by Ebert-May et al. [22]) after two national professional development programmes: Faculty Institutes for Reforming Science Teaching and the National Academies Summer Institute on Undergraduate Education in Biology at the University of Wisconsin which were all aimed at increasing knowledge about the principles of active learning and scientific teaching. The researchers used survey and video analysis of classroom teaching. A total of 221 participants were involved in the survey out of which 77 were selected for the video analysis. From the analysis of the results of the survey, it found that the most significant and consistent predictor variable on reform teaching practice after professional development was teaching experience that is the number of years of teaching. There was a negative correlation between years of teaching and implementation of reform teaching practice showing the new teachers implemented the reform based teaching practice introduced in the professional development to a greater extent than the experienced teachers.

A qualitative case study approach was use by Klein and Riordan [6] to study eight teachers from New York City who participated in a professional development on the use of expedition in teaching. The researchers identified teaching

experience as a factor affecting professional development implementation. They noted that one big challenge in professional development is how to “differentiate” professional development for teachers with different teaching experience.

A study was conducted by Desimone, Smith, and Ueno [22] using data from a survey, it was found that extent of teachers' content knowledge in mathematics had an impact on content-focused and sustained professional development participation. The researchers defined the extent of teachers' content knowledge to be the type of degree in mathematics and mathematics education. Using multinomial logit analysis, the researchers found that teachers who have their major in mathematics or mathematics education were more likely to participate in sustained content-focused professional development than teachers who did not major in either mathematics or mathematics education.

A study was designed to examine the relationship between features of a high quality professional development and self-reported change in teachers' knowledge and skills and classroom teaching practices [24]. The study data was part of national evaluation of Eisenhower Professional Development programme which provide financial support for the professional development of science and mathematics teachers. The researchers used data from Teacher Activity Survey of 1027 teachers in 358 districts. After the analysis of data, it was found that teachers experience in teaching had significant positive relationship with changes in teacher practices after engaging in professional development. However, there was a negative correlation between teachers' experience and enhancement in their knowledge and skills.

Supovitz and Turner [25] conducted a study to examine the relationship between professional development and reform indicators. The study found that teachers' years of experience had significant negative correlation with their investigative classroom culture while positively correlating with their use of inquiry based teaching practices.

### III. METHODS

The study employed descriptive cross sectional survey. The population for the study comprised all colleges of education tutors who teach physics. Every College of Education physics tutor in the 48 public colleges of education in Ghana was considered to be a likely participant for the survey part of the study. Physics tutors from public Colleges of Education took part in the online survey because they have been involved in the professional development. The total population of physics tutors was estimated to be 96. Concerted effort was therefore, made by the researcher to reach as many college physics tutors as possible through an online survey. In all 85 physics tutors took part in the online survey. The research instrument used in collecting data for the study was a questionnaire which

was designed by the researchers as an online instrument using Google forms. The online questionnaire was used since it is convenient, cost effective, reliable and saves a lot time. Again, lot of physics could be reached at the same time using the online questionnaire without the researchers travelling to the various colleges. Questionnaires are considered the most appropriate means of collecting data on large samples. But it has been criticised for mainly reporting “good” professional development implementation while mostly ignoring “bad” implementation [21].

The questionnaire was developed based on the content and aims of the professional development that the tutors have been engaged in. To ensure validity, the instrument was given to one professional development coordinator, and two physics tutors to check whether the items were in line with the objectives of professional development. The questionnaire was converted into an online survey form using google. It was then pilot tested using ten physics tutors. These teachers completed the online survey and their responses were used to establish the reliability of the instrument. The NTS and NTECF subscale had an alpha value of .942 while the 4-year B. Ed curriculum had .951. Data to answer the research questions were analysed using means and standard deviation whereas data to test the hypothesis was analysed using analysis of variance (ANOVA).

#### IV. RESULTS

The purpose of this study was to find out the perception of the physics tutors about the impact of a professional development on their knowledge about the NTS, NTECF and the 4-year B. Ed curriculum.

##### 4.1 Demographic Characteristics of Respondents

The demographic characteristics of respondents which include their teaching experience, qualification and gender is presented in Table 1.

**Table 1:** Respondents demographic characteristics

Variable	Categories	Frequency	Percentage
Teaching experience	1-5	17	20.0
	6-10	32	37.6
	11-20	34	40.0
	21 and above	2	2.4
Qualification	PhD	1	1.2
	Mphil	25	29.4
	MSc.	19	22.4
	Med	33	38.8
	First degree	7	8.2
Gender	Male	78	91.8
	Female	7	8.2

From Table 1, it can be seen that of the 85 respondents, 78(91.8%) were male and 7(8.2) were female. On academic qualification, it can be seen that majority of the tutors had master’s degree in education (38.8%) with one person having a PhD. Majority of the tutors had taught from 11-20 years.

##### 4.2 Research Question One

This research question was intended to find out the perceived impact of the professional development on physics tutors’ knowledge about the National Teachers Standard and National Teacher Education Curriculum Framework. There were seven items on the questionnaire that measured the impact of the professional development on tutors’ knowledge of the National Teachers Standard and National Teacher Education Curriculum Framework. The responses to the items on the questionnaire were in a four point Likert format ranging 0 (no impact) to 3 (great impact). For the purpose of the discussion, a standard mean of 1.5 which averages the score was used for interpretation. Values below 1.5 were considered as low impact while values above 1.5 were considered as great impact. The scores of the respondents are presented in Table 2.

**Table 2:** Means and standard deviations scores for items on perceived impact of professional development on tutors’ knowledge about the NTS and NTECF

Item	Mean	Standard deviation
Understanding of the use of the National Teachers’ Standard(NTS)	2.11	.82
Understanding the philosophy and legal underpinnings of the NTS	2.11	.91
Identifying which standards will be address by my lesson	2.31	.86
Understanding of the National Teacher Education Curriculum Framework	2.34	.81
Implication of the National Teacher Education Curriculum Framework on my work as tutor	2.25	.86
Implication of the National Teacher Education Curriculum Framework for student teachers	2.18	.90
Understanding of the proposed structure of the curriculum framework.	2.14	.87
Average score	2.22	.73

For example, the item “Understanding of the National Teacher Education Curriculum Framework” was given the highest score with a mean of 2.34 and a standard deviation of .81. This was followed by item “Implication of the National Teacher Education Curriculum Framework on work as tutor” which had a mean of 2.25 and a standard deviation of .86. Among all the seven items on this subscale, the item “Understanding the philosophy and legal underpinnings of the NTS” was among items with the least mean but has the highest spread in terms of responses ( $\bar{M}=2.11$ ,  $SD=.91$ ).

##### 4.3 Research Question Two

Research question two sought to investigate the perceived impact of the professional development on physics tutors’ knowledge about the 4-year Bachelor of Education

Curriculum. There were eight items on the questionnaire that measured the perceived impact of the professional development on tutors’ knowledge about the 4-year Bachelor of Education Curriculum. The scores of the respondents are presented in Table 3.

From Table 3, it can be seen that the item “Integration of subject knowledge and pedagogical knowledge” had the highest mean score of 2.29 with a standard deviation of .84. This was followed by the item “Understanding of the philosophy, structure and content of the new 4-year Bachelor of Education curriculum” in terms of mean score (M=2.28, SD=.68). The item “Understanding of the benefits and challenges of assuring quality delivery in the new curriculum” has the least mean score of 2.08 and a standard deviation of .93. This lowest mean is greater than the standard mean of 1.5 which indicates that all the items were rated by tutors as having great impact on tutors’ knowledge about the 4-year Bachelor of Education Curriculum as depicted in the overall mean score 2.19 and a standard deviation of .87 which is also greater than the standard mean of 1.5.

**Table 3:** Means and Standard Deviations Scores for Items on Perceived Impact of Professional Development on Tutors’ Knowledge about the 4-year B.Ed Curriculum

Item	Mean	Standard deviation
Understanding of the philosophy, structure and content of the new 4-year Bachelor of Education curriculum	2.28	.68
Inclusivity and equity standards in the curriculum	2.16	.91
Understanding of principles guiding learning outcomes	2.25	.84
Integration of subject knowledge and pedagogical knowledge	2.29	.84
Producing course manuals for the courses I teach	2.25	.86
Understanding of the features of supported teaching in school (STS).	2.13	.95
Aligning performance indicators, teaching and assessment	2.13	.96
Understanding of the benefits and challenges of assuring quality delivery in the new curriculum	2.08	.93
Average scores	2.19	.87

*Hypothesis*

The hypothesis was stated to be tested if there was a statistically significant difference in the perceived impact of the professional development by the physics tutors based on their qualification. The differences were tested using the one-way analysis of variance (ANOVA) test to compare the mean scores of respondents at an alpha level of .05. The data was tested for “Homogeneity of Variances” assumption by inspecting Levene’s test which was not significant (p =.318). The non-significant value suggests that variances within the factor across qualification are assumed equal and hence, homogeneity of variances assumption was not violated.

As shown in Table 4, the result showed a non-statistically significant difference in the perceived impact of the professional development based on tutors’ qualification [F (4,79)= .832, p = .509]

**Table 4:** ANOVA test for perceived impact of professional development based on tutors’ qualification

	Sum of squares	df	Mean Square	F	Sig.
Between groups	.873	4	.218		
Within groups	20.726	79	.262	.832	.509
Total	21.599	83			

V. DISCUSSION

According to van Driel et al. [4] professional development can have an effect on teacher’s cognitions (i.e. their knowledge, beliefs and attitudes).The NTS and NTECF having an overall mean of 2.22 indicates that the impact of dimension of professional development on tutors’ knowledge was great. This means that the tutors understand the philosophy, the legal underpinning and the use of the National Teachers’ Standard. The results also mean that the tutors understand the NTECF and its implications on their work.

The overall impact of professional development on tutors’ knowledge about the 4-year B.Ed curriculum was found to be 2.19 with a standard deviation of .87. These results indicate that impact of the professional development on tutors’ knowledge about the 4-year bachelor of education curriculum was great. Tutors indicated the professional development has enhanced their understanding of the philosophy, structure and content of the new 4-year Bachelor of Education curriculum, principles guiding learning outcomes and features of supported teaching in school. The results also mean that the professional development has greatly impacted tutors’ knowledge on issues of inclusivity and equity standards in the curriculum and integration of subject and pedagogical knowledge. The result is in line with several studies which show a positive correlation between professional development and teachers’ knowledge and skills [17; 18; 19].

The result from the ANOVA as shown in Table 4 indicates a non-statistically significant difference in the perceived impact of the professional development based on tutors’ qualification. This means that irrespective of the qualification of the physics tutors, they perceived the impact of the professional development to be the same. There were three major qualification levels of the physics tutors; PhD, Masters and First Degree. Given that all the dimensions of the professional development were impactful and that there was no difference in the perceived impact it can be deduced that PhD, Masters and First Degree holders who are teaching physics at colleges of education believe that professional development made an impact on their knowledge about the NTS, NTECF and the 4-year B.Ed curriculum . This could be due the fact that these reform ideas which are being taught at the professional development session are new, therefore tutors

no matter their qualification find the information useful. For example, the ideas about NTS and Supported Teaching in Schools in the 4-year B.Ed curriculum are all new reforms in the Ghanaian educational sector for which all categories of tutors will need to be abreast with.

The results however contradict a research carried out by Desimone et al. [23] where, it was observed that extent of teachers' content knowledge (which is based on teachers' qualification) in mathematics had an impact on their participation professional development.

## VI. CONCLUSIONS

The results imply that because of the professional development programme, the tutors now have a good working knowledge about the National Teachers' Standard and the National Teacher Education Framework and their implications for the tutors' work. The impact of the professional development means tutors will be able to comprehend the usage of the NTS which is the foundation upon which the new 4- year B.Ed curriculum was built [26]. The results imply that the tutors understand how to deliver the new curriculum in a way that ensures that the products are "teachers who have passion for teaching and leadership, are reflective practitioners, and who engage with members of the wider community, always acting as prospective change agents" [26, p. 5].

## VII. LIMITATION OF THE STUDY

The data used in the study is cross-sectional in nature in which alternative causal impact cannot be ruled out. Also, it was based on teachers' self-report so the results may not represent the actual practice as teachers could exaggerate the impact of the professional development

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