

Teacher's Experience, Educational Qualification and Mastery of Difficult Concepts in Physics in Calabar Metropolis, Cross River State, Nigeria

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Abstract

The study aims to determine teachers' experience, educational qualification and mastery of difficult concepts in physics. An ex-post facto research design was used for the study. Two research designed questions and two hypotheses were posited and tested at 0.05 levels of significance. Influence of Teachers' Experience and Educational Qualification on Mastery of Difficult Concepts in Physics Questionnaire (ITEEQMDCPQ) was designed using a 5-point Likert scale. The reliability of 0.78 was obtained using the Pearson Product Moment Correlation Coefficient. The questionnaire was administered purposively to 246 senior secondary school Physics teachers, and 240 was retrieved from 98 senior secondary schools in the area of study. Data was analyzed using One-way Analysis of Variance for a single mean. Results of the analysis shows that teacher experience and educational qualification has a significant influence on mastery of difficult concepts in Physics, based on the findings it was recommended that teachers should undergo more training programs to gain more experience in teaching to enhance their mastery of concepts. Teacher should be encouraged to further their education to acquire higher educational qualifications.

Keywords: Teachers' experience, educational qualification, mastery of concepts in physics

Introduction

Mastery of concepts in physics is an essential skill required by a physics teacher to endow him/her in the teaching process. Mastery of concepts in subject areas makes it easier for a teacher to teach effectively without hindrances. This is important for successfully teaching in the classroom to the understanding of student problems. Understanding and mastery of difficult concepts implies that the teacher is able to grasp necessary knowledge of the difficult concepts that can be impacted to the student to avoid misconceptions of any sort. Kamamia, Ngugi and Thinguri (2014) explained that teachers require among other things the skills of mastering the subject matter which is essential for the professional preparation to anchor firmly on a foundation of general education. A teacher with good knowledge of physics is able to teach the lesson by a way of highlighting the main points of the lesson to the students.

It is through mastering that the teacher is able to impact the right skills of communication, collaboration, critical thinking and creativity that are based on the three levels of learning domains of cognitive, affective and psychomotor (Kamimia, Nigugi & Thinguri, 2014). Oyelami (2010) explained that problem-solving strategies in physics include seminars, independent research and interdisciplinary project since different teachers have different areas of difficulty making them to approach physics concepts differently. Furthermore, Oyelami (2010) contend that learning Physics involves a mixture of physics exercises, computation on computer and problem solving capability for deeper understanding of the nature and its laws. Harrison (2011) explained that physics involves only a few powerful concepts. Once those concepts are understood, they are applied to solve problems easily. Career Guide (2021)

defines teaching experience as the culmination of skills, exposure or training acquired over time that enables the teacher to perform or prepare for teaching effectively. It helps in broadening the teachers' knowledge, skills and leads to building teachers' confidence. Teachers' experience is also seen as the number of years a teacher spend in teaching a subject (Physics), making the teacher to gain more knowledge opinion or skills. This is now reflected in their mode of teaching as a result of experience gained over time.

A teacher with teaching experience influence classroom practice by meeting the student needs, planning and delivering instruction, preparing lesson material as well as evaluating student performance in order to investigate the outcome of the lesson taught. It is therefore imperative to note that the number of years spent teaching a subject might have helped the teacher gain enough experience as to master the subject he/her have been teaching, unlike teacher with little or no experience. Teacher's educational qualification singles him/her out to be able to impact the necessary knowledge to the students in the teaching process. A qualified teacher as defined by Darling-Hammond (2007) as one who is truly certified and holds certificate in the field being taught. This is achieved after graduation from an accredited teacher education program (Zuzorsky, 2009).

Commeyras (2003), in the research work promoting a culture of reading contend that experience improves teaching skill while learner can do better at the hand of teachers who have taught continuously over a period of time. Rodriques and Mckay (2010) contend that experienced teachers are those who have taught for many years and are able to motivate students and hold their attention and know how to manage their lesson and manage the classroom effectively. Marhundutse (2014) explained that experience is one of the major factors contributing to effective teaching. The fact is that a dedicated teacher who has taught for some years is endowed with experience on how to help the students to understand better and achieve higher in their academic work provided the students are ready to learn.

The work of Ayeshung (2020) reveals that some teachers have some challenges in teaching certain concepts in physics which varies from teacher to teacher, while some teachers have no challenge in teaching any specific physics concepts. The results obtained as explained for those with challenge might be as a result of difficulties in the educational qualifications or experience that brings about these challenges. To achieve a unified educational system, teacher qualification and experience play a very important role in the prerequisite knowledge given to the students. Mastery of concepts in physics with necessary educational qualification and experience undertaken by a teacher will go well with the students' understanding of what they have been taught. While following the law of Teachers' Registration Council of Nigeria (TRCN 2004) stated that, certified teachers must be holder of TRCN. Bello (2016) maintains that an uncertified teacher cannot prepare students for examination because it is unlikely that students taught by such teachers would come out with a good result. Adodo and Oyeniyi (2013) are of similar notion that a teachers educational qualification is a factor ascribed to the basis of students' academic achievement in the process of learning.

In a study conducted by Owolabi and Adedayo (2012) on effects of teachers' educational qualification on senior secondary school students' performance in physics, result shows that, physics students perform better when taught by highly qualified teachers than those taught by a teacher with lower qualification. This is as a result of the mastery of difficult physics concepts by the highly qualified and experienced teachers. On the same note, the finding of Bolarinwa, Kolawole, Ayodele, Funke and Adelule (2020) in their research work on teaching experience and educational qualification on correlates of academic performance of students, found that success in students' academic achievement are likely realized when students received instruction from teachers with good teaching experience. A teacher with many years of experience in teaching physics will have a better methods or ideals of teaching difficult concepts to the understanding of students.

Statement of the problem

Effective teaching and learning of Physics in secondary schools is poised with its own challenges. Physics being one of the Sciences is aimed at developing students' skill to invest in scientific processes. These processes might occur with interpretation and explanation and pose problems to students. The mastery of difficult Physics concepts by Physics teachers is an important issue bordering on the teaching of Physics in secondary schools for effective impartation of knowledge and skills.

Purpose of the study

The purpose of this study is to determine the influence of teachers' educational qualification and experience on mastery of difficult concepts in Physics.

Specifically the study sought to;

- i. Determine the extent to which teachers' experience influences their mastery of difficult concepts in Physics
- ii. Determine the extent to which teachers' educational qualification influences their mastery of difficult concepts in Physics

Research questions

The following research questions were asked to aid the study on influence of teachers' educational qualification and experience on mastery of difficult concepts in Physics

- i. To what extent does teachers' experience influence their mastery of difficult concepts in Physics?
- ii. To what extent does teachers' educational qualification influence their mastery of difficult concepts in Physics?

Research hypotheses

In carrying out the study, the following hypotheses were tested in their null form at 0.05 level of significance

- i. Teachers' experience does not significantly influence their mastery of difficult concepts in Physics
- ii. Teachers' educational qualification does not significantly influence their mastery of difficult concepts in Physics

Methodology

The study employed an ex-post facto research design. The population of the study cut across private and public schools' senior secondary schools in Calabar Metropolis, numbering 246 Physics teachers. Due to the population size, no sampling was done. It is therefore a census of all the senior secondary schools Physics teachers. As the population is relatively small, the size is manageable. Some secondary schools have three Physics teachers, as population size. A structured questionnaire consisting of two sections was used for the study to obtain dependable information. Section one of the questionnaire consist of personal information of the respondents, while section two comprised of concepts in physics based on the research purposes with five option responses. Face and content validity of the items were done to test their relevance. A reliability coefficient of 0.78 was obtained using Pearson's Product Moment Correlation Coefficient. Out of the 246 questionnaire distributed, 240 were retrieved. Data were analyzed using mean and standard deviation to obtain answers for the questions. One-way Analysis of Variance was used to test the null hypotheses at 0.05 level of significance.

Results

The results for the study are presented according to research hypotheses.

Hypothesis 1:

Teachers’ experience does not significantly influence mastery of difficult concepts in Physics. To test this hypothesis, One-way Analysis of Variance (ANOVA) was applied with teachers’ experience as factor of mastery of difficult physics concepts as dependable variable. R

The F-ratio was used to test for significance of the overall influence. The results are given in Table 1

Table 1: One-way ANOVA of mastery of difficult concepts in Physics by teachers’ teaching experience

Teaching Experience Group	N	Mean	Std Dev.	Minimum	Maximum
1-7yrs	45	58.062	6.909	43	66
8-14yrs	90	48.923	11.768	25	67
15-22yrs	75	56.428	6.857	43	69
23yrs and above	30	51.512	5.242		40
Total	240	53.305	9.654	25	69

Source of variation	Sum of squares	DF	Mean	F-value	P-value
Between Groups	3574.823	3	1191.608	15.037*	.000
Within groups	18701.335	236	79.243		
Total	22276.158	239			

*Significant at .05 level. P<.05

From Table 1, teachers’ with 1 – 7 years teaching experience had the highest mean of mastery of difficult physics concepts with ($X = 58.062$), followed by those who had 15 – 22 years teaching experience ($X = 56.428$). Then teachers with 23 years and above who had mean value of ($X = 51.512$), followed also by those teachers with teaching experience of 8 - 14 years whose mean value is ($X = 48.923$). The P-value (.000) associated the computed F-value 15.037* is less than 0.05 as such the null hypothesis was rejected. This means that teachers’ teaching experience has significant influence on their mastery of difficult physics concepts. To locate the pair of group of mean responsible for the observed significant results, Fishers’ Least Significant Difference (LSD) test was applied. The results are given in Table 2.

Table 2: LSD Pair wise comparison of mastery of difficult concept in Physics by teachers’ years of teaching experience

Teachers’ Experience	1-7yrs	8-14yrs	15-22yrs	23yrs and above
1-7yrs	58.062**	9.140*	1.634	6.550*
8-14yrs	.000	48.923	3.505*	2.589
15-22yrs		.331	.000	56.428
23yrs and above		.000	.169	.011

*Significant at .05 level. P<.05

**Values along main diagonal are group mean, above it are mean differences (MD) and below it are corresponding P-values

The results in Table 2 shows that the mean difference when the teachers with 1 – 7 years teaching experience and those with 15 – 22 years were compared were not significant (MD = 1.634, P = 0.331 > 0.05). Similarly, the difference between those with 8 – 14 years teaching experience and those with 23 years and above teaching experience was not significant (MD = 2.589, p = 0.169 > .005). All other paired comparisons were significant.

Hypothesis2:

Teachers’ educational qualification does not significantly influence their mastery of difficult concepts in Physics. The procedure used in testing this hypothesis is the One-way Analysis of Variance (ANOVA) which was with teachers’ educational qualification as a factor for mastery of difficult Physics concepts as dependable variable. The results are presented in Table 3.

Table 3: One-way ANOVA of mastery of difficult concepts in Physics by teachers’ educational qualification

Teachers’ Educational Qualification Group	N	Mean	StdStd Dev	Minimum Error	Maximum
NCE	30	61.233	5.396	.985	47
B.Sc. (Ed)	105	49.322	11.084	1.082	25
M.Sc. (Ed)	81	56.038	6.847	.761	43
Ph.D	24	51.599	5.432	1.109	40
Total	240	53.305	9.654	.623	25

Source of Variation	Sum of Squares	DF	Mean Square	F-value	P-value
Between groups	4225.750	3	1408.583	18.417*	.000
Within groups	18701.335	236	79.243		
Total	22276.158	239			

The results in Table 3, shows that NCE teachers have the highest mean of mastery of difficult concepts in physics (X=61.233), follow by those with M.Sc. (Ed) (X=56.038), those with Ph.D (X=51.599) the less were those with B.Sc. (Ed) (X=49.322). The P-value (.000) associated with the computed F-value (18.417*) is less than .05. Hence, the null hypothesis was rejected. This means that teachers’ educational qualification has a significant influence on mastery of difficult concepts in physics. To locate the pair mean accountable for the significant results observed LSD test was carried out. The results are gain in Table 4.

Table 4: LSD pair wise comparison of mastery of difficult concepts in physics by teachers’ educational qualification

Teachers’ Educational Qualification	NCE	B.Sc.(Ed)	M.Sc. (Ed)	Ph.D
NCE	61.2	11.910*	5.195	9.634*
B.Sc. (Ed)	33**	49.322	6.716*	2.277
M.Sc. (Ed)	.000	.000	56.038	4.439*
Ph.D	.000	.251	.030	51.599

*Significant at .05 level. $P < .05$

**Value along main diagonal are group Mean, above it are Mean Difference (MD) and below it are corresponding P – values.

The results in Table 4 shows that only the difference between B.Sc (Ed) and Ph.D teachers (MD = 2.277) was not significant ($P = .251 > .05$). All other paired comparisons were significant ($4.439 << MD > 11.910, .000 < p < .030$)

Discussion of Findings

Teachers' experience and mastery of difficult concepts in Physics

The findings of this study indicated that teachers' years of teaching experience have significant influence on their mastery of difficult concepts in Physics. These results conform to the works of Boyd, Grossman, Lankford, Loab and Wyckoff (2008) who believed that teachers with many years of teaching experience will produce students with higher academic achievement due to continuous mastery of difficult concepts while teaching. Similarly, Bolarinwa, Kolawole, Ayodele, Fakunle and Adetula (2020) also agreed that students' success and academic achievement will likely be realized when they are taught by teachers with good and many years teaching experience. It is therefore imperative to note that the number of years spent in teaching Physics serves a better function in boosting the mastery of difficult concepts in Physics due to repetition of the same topics over and over (year in and year out).

Teachers' educational qualification and mastery of difficult concepts in Physics

The findings of this hypothesis showed that teachers' educational qualification has significant influence on their mastery of teaching difficult concepts in Physics. The findings is supported by the research works of Owolabi and Adebayo (2012) who explained that students' achieved higher academically when taught by teachers with higher academic qualification as compared to those students taught by teachers with lower educational qualification. Qualified teachers have undergone several stages of training in content knowledge, hence giving them an edge over the unqualified teachers.

Conclusion

The study is on influence of teachers' experience and educational qualification on mastery of difficult concepts in Physics. The results obtained shows that teachers' experience and educational qualification has significantly influence the mastery of difficult concepts in Physics. The study also shows that validity of the hypotheses stated and findings of the study were carried out through comparative analysis with relevant studies carried out by other researchers.

Recommendations

The following recommendations were made based on the research work.

1. Teachers should undergo retraining programs to enable them gain more experience and enhance their mastery of difficult concepts in Physics.
2. Teachers should be encouraged to acquire more educational qualification by furthering their studies in order to aid them have firm grasp and master difficult concepts in Physics.

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