Effects of Teacher Training in Mathematics on Public Secondary School Students' Academic Performance in Bamenda III Subdivision – Cameroon

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ABSTRACT

This study set out to determine the effects of teacher training in mathematics on public secondary school students' academic performance in Bamenda III subdivision. The study adopted the descriptive survey and expost-facto research designs. The population of the study was made up of 45 mathematics teachers from the five public secondary schools in Bamenda III subdivision. The sample was selected using the purposive sampling technique. Specifically, the total population sampling method was employed due to the small size of the population. Data was collected using a self-designed questionnaire for mathematics teachers. The data collected was analyzed using both descriptive and inferential statistics. Specifically, means, correlation and coefficient of determination were used to answer the research questions while p-value and regression analysis were used in testing the hypotheses at the 0.05 level of significance. The findings of this study revealed that teacher professional development, in-service training in mathematics and teaching practice in mathematics all significantly affect secondary school students' academic performance in Bamenda III subdivision. Consequently, it was recommended that education authorities in Cameroon should develop programs aimed at training and re-training teachers to enable them update their knowledge, teaching skills, and learn new teaching strategies that enhance the teaching learning process. Also, the education authorities should encourage all mathematics teachers to develop themselves through in-service training, regular attendance of mathematics workshops, seminars and conferences.

Keywords: Teacher Training, Teacher Professional Training, In-service Training, Teaching Practice, Mathematics, Public Secondary School, Students' Academic Performance.

INTRODUCTION

Teacher training (TT) is a vital tool in education whose main objective is to furnish teachers with skills and knowledge to teach in various schools. A teacher training program (TTP) provides teachers with the educational resources and further training they need to develop their expertise in a variety of fields, as well as provide them with technical help. According to Meizieobi (2013), TT is the process through which all teachers in the nation are professionally trained to qualify for the teaching tasks as well as keep abreast of changes or innovations in teaching consequent upon technological developments that impact on teaching and learning.

Lumag and Wask (2019) point out that TT empowers the teachers with the skills (teaching and soft skills) that would enable them to carry on their functions in the most efficient and effective manner. Nowadays, teacher training is a fundamental necessity for all educational activities, including the creation of a conducive learning environment, development and execution of curriculum, and the assessment of students.

A trained person is likely to have more skills and techniques to be applied for the better academic achievements of learners (Ulla, 2018). A teacher having better teaching skills can also promote students' interest in a particular subject (Giovazolias et al., 2019).

TT provides opportunities to teachers to acquire theoretical knowledge of the professional functions and responsibilities of teaching. It introduces new innovations in the teaching profession. The training and development of teachers are vital to ensure overall national development and enlightenment, as no society can rise above the quality of her teachers. TT gives the digital tools to teachers to improve their teaching methods. It helps teachers to foster better partnerships with their students who feel strongly connected to their teachers and are more likely to receive more constructive guidance as they engage in meaningful conversations with their teachers. Most researchers including Obiekwe (2018), Colombo and Stanca (2008), and Nwachukwu (2006), maintained that training is a fundamental and effectual instrument in successful accomplishment of any organization's goals and objectives, resulting in higher efficiency and improved productivity.

Within the education sector, teaching practice is a compulsory course for all aspiring student teachers registered in a teacher preparation program in Cameroon. It is a form of work-integrated learning that is described as a period of time when students are working in the relevant institution to receive specific in-service training in order to apply theory in practice. During teaching practice, a student teacher is given the opportunity to try the art of teaching before actually getting in to the real world of the teaching profession. Teaching practice or practicum is a key component of a TTP. It should be the central pivot of the professional training (Bajwa et al., 2010).

The goals of teaching practice are similar in most teachers' training institutions. That means teaching practice is a compulsory course in all the teacher training institutions in Cameroon. In three state universities which have schools of education-Ecole Normale Superieure (ENS) for the training of secondary school teachers (in Yaounde, Bamenda and Maroua), a period of three months is blocked for teaching practice and it is done only once until the student graduates. During this time, lectures are suspended so that student teachers and their supervisors can concentrate on the teaching practice. Students are posted to different schools and they are assigned to cooperating teachers who are selected based on their competence and to university supervisors only from the Faculty of Education, who are expected to see the students at least twice during this session. After observing the cooperating teacher, they begin teaching and the cooperating teacher follows up the student closely in all aspects of the student's professional life.

Currently, the need for improved academic performance of students especially in mathematics has become universally accepted and that it depends on the efficient and effective training of teachers. This high interest placed on training of teachers is based on the current realization that teachers in any society are its most important assets and the bedrock for the organizations development (Nwaeke & Obiekwe, 2017). The performance of teachers in any educational system is a reflection of the skills, abilities, knowledge, competency and expertise the teachers have acquired over time during training and development programs.

Contextually, the MasterCard Foundation and the government of Cameroon have launched TTP Cameroon whose purpose is to improve learning outcomes in mathematics for secondary school students and to increase the number of boys and girls who pursue Science, Technology, Engineering and Mathematics (STEM) education at the tertiary level. The program trains university professors, educational inspectors and experienced mathematics teachers. The goal is to strengthen the delivery of mathematics content at the secondary level across the country to enhance the pipeline of students, especially girls, transitioning in to STEM fields at the tertiary level. TTP Cameroon also launched an e-learning platform for online training and a Community of Practice to facilitate interaction between mathematics teachers, researchers, parents and all interested parties. The introduction of these programs partially resulted from the fact that there are many university graduates who have not yet undergone training in the teaching of mathematics, but who are

currently teaching mathematics in secondary schools. Some even argue that they can do as well or even teach better than the trained mathematics teachers. One however wonders why the trained and the untrained mathematics teachers all claim to be good teachers, yet year after year, results at the GCE ordinary level do not corroborate their assertions. This is the major reason why this study set out to determine the determine the effects of teacher training in mathematics on public secondary school students' academic performance in Bamenda III subdivision.

Objectives of the Study

The study was guided by the following objectives:

- To determine how teachers' professional development and in-service training in mathematics affect students' academic performance in Bamenda III subdivision.
- To assess the effects of teaching practice in mathematics on students' academic performance in Bamenda III subdivision.

Research Questions

- How do teachers' professional development and in-service training in mathematics affect public secondary school students' academic performance in Bamenda III subdivision?
- What is the effect of Teaching practice in mathematics on students' academic performance in Bamenda III subdivision?

Hypotheses

Ho_1: Teachers' professional development and in-service training in mathematics do not significantly affect secondary school students' academic performance in Bamenda III subdivision.

Ha_1: Teachers' professional development and in-service training in mathematics significantly affect secondary school students' academic performance in Bamenda III subdivision.

Ho_2: Teaching practice in mathematics has no significant effect on secondary school students' academic performance in Bamenda III subdivision.

Ha_2: Teaching practice in mathematics has a significant effect on secondary school students' academic performance in Bamenda III subdivision.

METHODOLOGY

This study adopted the descriptive survey and the expost-facto research designs. Descriptive survey research design was appropriate for this study because of the cross sectional nature of the data collected. The researcher also incorporated the expost-facto research designs because the independent variable was not manipulated but had already occurred. Thus, this design allowed the researcher to explore simple cause-effect relationships between the variables. The study was carried out in the Bamenda III subdivision, located in Mezam division of the North West region of Cameroon. Bamenda III is one of the seven subdivisions of Mezam Division which became a subdivision in 2007 following Presidential Decree No. 2007/117 of 24th April 2007. Geographically, Bamenda III lies between latitudes 6'15 and 6'25N and Longitude 10'02 and 10'15E of Greenwich Meridian.

The population of this study comprised of 45 mathematics teachers from the five public secondary schools in Bamenda III subdivision, (see table 1).

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Table 1: Population of Mathematics Teachers in Public Secondary Schools in Bamenda III Subdivision

S/N	Name of School	Population of Mathematics Teachers
1	GBHS Atiela	11
2	GBHS Bayelle	12
3	GTC Nkeung	02
4	GTHS Bamenda	11
5	GTHS Nkwen	09
Total		45

The sample of the study consisted of all the 45 mathematics teachers in all the five public secondary schools in Bamenda III subdivision. This sample was selected using the purposive sampling technique. Specifically, the total population sampling method was employed due to the small size and the accessibility of the population of the study.

The data collection instrument in this study was a self-designed structured questionnaire. The items were rated on a four-point Likert scale. Documents examined to obtain the performance of students included the GCE Ordinary Level results in mathematics for the academic years 2019/2020, 2020/2021 and 2021/2022 in all the five public secondary schools. After formulating the instrument, the researchers gave them to three experts to vet. The experts were required to ascertain the clarity of the instruments, appropriateness of language use and to determine whether the questions/statements would bring out the expected responses. The comments, observations and views of the experts meant to improve the quality of the items and were taken into consideration in developing the final instruments. No Content Validity Index (CVI) for any of the questionnaire items was less than 0.7, considered to be a cutoff point for a valid item.

After validating and refining the instruments, they were pilot tested using 5 mathematics teachers from three private schools within Bamenda III. The data collected was used to determine the Cronbach alpha reliability of the questionnaire. The Cronbach alpha reliability of the teachers' questionnaires yielded an index of 0.84. Thus, the reliability of the questionnaire was assured as the minimum acceptance value for Cronbach's alpha according to Bernard (2002) is 0.7.

The principals of the five schools were consulted and the questionnaires were distributed to the mathematics teachers. The questionnaires were administered and personally supervised by the researcher. The heads of the different mathematics departments in the various schools also assisted in administering the questionnaires to the members of their departments who were not present when the researcher was personally administering the questionnaires. Furthermore, they provided vital information relating to the number of trained and untrained staff in their departments.

Data was analyzed using both descriptive and inferential statistics. Specifically, means, correlation and coefficient of determination were used to answer the research questions while regression analysis and its various outputs were used in testing the hypotheses at the 0.05 level of significance.

RESULTS AND DISCUSSION

Effects of Teacher Professional Development (TPD) and In-service Training in Mathematics on Public Secondary School Students' Academic Performance (SAP).

Research Question One: *How do TPD and in-service training in mathematics affect public secondary*

school SAP in Bamenda III subdivision?

Table 2: Regression Model Summary for TPD and In-service Training in Mathematics and SAP

Model	R	R-Square	Adjusted R-Square	Std. Error of the Estimate
1	.583	.340	.329	4.813

The model summary table shows that a moderate positive relationship (R = 0.583) exists between TPD and in-service training in mathematics and SAP. This implies that an increase in TPD and in-service training in mathematics leads to an increase in SAP. Furthermore, R-Square for the overall model is 0.340, with an adjusted R-Square of 0.329. This suggests that 34.0% of the variations in SAP in mathematics can be accounted for by TPD and in-service training in mathematics.

Ho_1: *TPD and in-service training in mathematics do not significantly affect secondary school SAP in Bamenda III subdivision.*

Ha_1: *TPD and in-service training in mathematics significantly affect secondary school SAP in Bamenda III subdivision.*

Table 3: Regression Coefficients for TPD and In-service Training in Mathematics and Students' Academic Performance

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.324	1.312		2.147	.061
	TPD and In-service Training in Mathematics	.273	.103	.163	2.681	.023

The table for regression coefficients indicates that the regression equation is given by

Students' Academic Performance = 2.324 + 0.273 x *Teachers' Professional Development and In-service Training in Mathematics*

Thus when there is no TPD and in-service training for mathematics teachers, SAP is at 2.324. When TPD and in-service training in mathematics, increase by one unit, students' academic performance increases by 0.273. This increase is significant at the 5% level of significance as indicated by the p-value of 0.023.

Table 4: ANOVA Table of Regression Analysis for TPD and In-service Training in Mathematics and Students' Academic Performance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	243.232	1	243.232	6.827	.023
	Residual	10261.561	43	39.294		
	Total	10504.793	44			

The ANOVA table shows that F(1,43) = 6.827 with p = 0.023. This suggests that there is a significant effect of TPD and in-service training in mathematics on SAP. Consequently, Ho_1 is rejected. It can therefore be

concluded that TPD and in-service training in mathematics significantly affects secondary school SAP in Bamenda III subdivision.

Therefore, the finding of the study revealed that teachers' professional development and in-service training in mathematics significantly affect secondary school students' academic performance in Bamenda III subdivision. This finding corroborates that of Cai and Aning (2020) who found that teachers' professional development programs improved teacher's research abilities and instructional methods. The finding of the study also agrees with that of Marwish, et al. (2014) who established a positive relationship between teachers' professional development and students' academic performance. Lastly, the finding also supports that of Oluwole et al. (2017) who indicated that teachers' attendance of conferences, workshops and in-service training has significant influences on students' academic achievement in Benue and Nasarawa State.

Thus, the finding of this study suggests very strongly that when teachers undergo professional development and in-service training, their individual skills, attitudes, teachings methods, knowledge of subject matter, application of new strategies regarding the curriculum among others, are updated to meet the changing times. These remarkable improvements are visible in the performances of their students.

Effect of Teaching Practice (TP) in Mathematics on Students' Academic Performance

Research Question Two: *What is the effect of TP in mathematics on students' academic?*

Table 5: Regression Model Summary for TP in Mathematics and Students' Academic Performance

Model	R	R-Square	Adjusted R-Square	Std. Error of the Estimate
1	.731	.534	.513	.501

The model summary table shows that a high positive relationship (R = 0.731) exists between teaching practice in mathematics and students' academic performance. This implies that an increase in teaching practice in mathematics leads to an increase in students' academic performance. Furthermore, R-Square for the overall model is 0.534, with an adjusted R-Square of 0.513. This suggests that 53.4% of the variations in students' academic performance in mathematics can be accounted for by the teaching practice which mathematics teachers went through.

Ho_2: *TP in mathematics has no significant effect on secondary school SAP in Bamenda III subdivision.*

Ha_2: *TP in mathematics has a significant effect on secondary school SAP in Bamenda III subdivision.*

Table 6: Regression Coefficients for TP in Mathematics and Students' Academic Performance

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.104	.247		.462	.646
	TP in Mathematics	.359	.136	.295	8.703	.000

The table for regression coefficients indicates that the regression equation is given by

Students' Academic Performance = 0.104 + 0.359 x *Teaching Practice in Mathematics*

Thus when mathematics teachers do not go through teaching practice, students' academic performance is at 0.104. When teaching practice in mathematics increases by one unit, students' academic performance increases by 0.359. This increase is significant at the 5% level of significance as indicated by the p-value of

0.000.

Table 7: ANOVA Table of Regression Analysis for TP in Mathematics and Students' Academic Performance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	37.712	1	12.924	50.426	.000
	Residual	18.026	43	.251		
	Total	55.738	44			

The ANOVA table shows that F (1,43) = 50.426 with p = 0.000. This suggests that there is a significant effect of teaching practice in mathematics on students' academic performance. Consequently, Ho_2 is rejected. It can therefore be concluded that TP in mathematics significantly affects secondary school students' academic performance in Bamenda III subdivision.

Therefore, the finding of this study reveal that there is a significant effect of teaching practice in mathematics on students' academic performance. This finding supports that of Aubrey (2017), who established a significant correlation between teaching practice and student growth. The finding of this study is also in line with that of Oluwafemi (2010) who indicated that teaching practice has never been a waste of time rather it has helped to inculcate the professional traits in student teachers, preparing them for the real classroom thereby improving students' academic performance.

The finding of this study suggests strongly that when teachers undergo teaching practice, they develop a positive attitude towards the teaching profession, develop skills and competencies of teaching, gain knowledge in the real teaching and learning milieu, they select and use a variety of teaching strategies and instructional resources that are appropriate to achieve stated goals in the lesson plan among others.

CONCLUSION

This study which set out to determine the effects of teacher training in mathematics on public secondary school students' academic performance in Bamenda III subdivision in Cameroon arrived at the conclusion that teacher professional development, in-service training in mathematics and teaching practice in mathematics all significantly affect secondary school students' academic performance in Bamenda III subdivision. Consequently, it was recommended that education authorities in Cameroon should develop programs aimed at training and re-training teachers to enable them update their knowledge, teaching skills, and learn new teaching strategies that enhance the teaching learning process. There should also be continuous refresher courses for mathematics teachers. Furthermore, educational authorities should encourage all teachers to develop themselves through in-service training, regular attendance of workshops, seminars and conferences organized in their various disciplines in order to update their knowledge and acquire relevant teaching skills that will help them to transmit appropriate knowledge to their students as the findings of this study have revealed that all the aforementioned lead to improvement in students' academic performance.

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