Summer Upgrading Program at Colleges of Teacher Education and Its Impact on Improving Teachers' Professional Growth and Students' Achievement: Experiences from Tigray, Ethiopia

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Received: 27 June 2019; Accepted: 23 May 2022

Abstract: *Teacher education and teachers' professional competence as critical pillars guide efforts about educational growth in Ethiopia. The Tigray Regional State of Ethiopia embarked on a summer upgrading program for teachers from a certificate level to a diploma level in teaching at primary schools with the ultimate goal of improving teachers' competence and students' achievement. This study investigated the summer upgrading program and its impact on improving teachers' professional growth and students' achievement. A survey design was employed with multistage sampling and a sample of 514 upgraded teachers. A questionnaire, classroom observations, key informant interviews, and focus group discussions were employed. Data analysis revealed statistically significant differences between gender and among zones. The proportion of students with scores above 50% increased across the years with a 7% increase from 2014 to 2015, and a 10% increase from 2015 to 2016, while the proportion of scores above 75 was shown to be 1% from 2014 to 2015, and a 3% from 2015 to 2016. A significant difference was also observed between the expected and observed values in the proportion of students in each category of scores. Finally, the study concluded that the upgrading worked out for self-reflected professional growth, but not consistently on the learning achievements of students. It was recommended that to mitigate related problems concerned bodies should put in place mechanisms to ensure upgraded teachers demonstrate continued engagement in their schools; align the workplace situation and the upgrading programs, and devise ways of tracking career structure such as taking a certain number of credits each year*.

Keywords: summer upgrading, professionalization, teachers' practice, students' achievement

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Introduction

Several reports such as EGRA (2018); NEAEA (2016) and Tesfaye (2014) highlighted that quality of education is at stake in Ethiopia. One of the manifestations of poor quality is unsatisfactory teacher education. The Ministry of Education (MoE) embarked on improving the quality of general education through its General Education Quality Improvement Programs (GEQIP I: 2008, GEQIP II: 2012, and recently GEQIP-E, 2016) and highlighted the milestones stated in the Education Sector Development Programs (ESDPs: I – V, the fifth being a program for 2015/16 – 2019/20) in which primary school teacher education was one focus area. Although one of the goals of general education is *to improve [the] quality of general education to motivate children to complete primary and secondary schools and provide them with the knowledge, skills, and values to become productive and responsible citizens* (Federal Ministry of Education ESDP V: 2015/16 – 2019/20, p.35), the intended improvement in the quality of learning and education in the general education program has not yet been achieved. This is substantiated by studies such as the National Learning Assessments (GEQAEA, 2008; NEAEA 2013, 2016) and the Early Grade Reading Assessment (EGRA, 2016, 2018) that do not show remarkable improvements in students' academic achievement. One of the factors that Zewdu (2010) noted was teacher-related variables because for effective teaching and learning to take place, teachers need to possess some sufficient degree of experience (Mupa & Chinooneka, 2015). In other words, to improve the quality of learning and teaching teachers should actively extend their knowledge and skills not only in the areas of their specialization but also their general teaching skills that ultimately should prove to bring improved student academic achievement and learning outcomes.

Furthermore, Christine and Gillespie (2007) and Tatto and Peck (2012) pointed out that teachers are one of the most important factors in raising student achievement. It is widely acknowledged that the most important

factor is the quality of teachers and teaching (MoE, 2013). In addition, various areas of education research highlight the importance of teachers learning about student thinking in promoting student-centered instruction (Wilson et al., 2015). Hence, higher standards for teachers must accompany the push for higher standards for students. This requires the need to professionalize teachers which stems from the fact that one needs to be distinguished *as a teacher* that ultimately improves students' achievement. The belief that disciplinary knowledge automatically results in pedagogical excellence is too simplistic. Thus, the need for an upgrading teacher education program geared towards developing teachers' subject matter mastery and pedagogical skills was considered pressing, which Shulman (1986) coined as pedagogical content knowledge (PCK) and one of the milestones of the Curriculum Framework for primary teacher education (MoE, 2013).

Notwithstanding the aforementioned, the Tigray Regional State Education Bureau embarked on the summer upgrading program that was introduced in 2009/10 (2002 E.C.) with the view that the upgraded teachers would be able to mitigate some of the manifested quality problems and help in improving the quality of education. Consequently, a significant number of teachers have been upgraded from a certificate to a diploma. In Tigray Regional State, the Regional Education Bureau, in deploying its massive upgrading strategy for 1st and 2nd cycle teachers starting from 2009 (2002 E.C), has trained more than 10,000 teachers to a diploma level through the summer upgrading program. Despite this number of upgraded teachers, achievement of the intended objectives of the program such as becoming teaching professionals, improving teaching practices and enhancement of student learning need to be investigated. To this effect, it is felt important to see if the program has resulted in the expected level of competence of teachers and student achievement over the years following the graduation of the upgraded teachers. Hence, this study investigates how much the upgrading training program has impacted the professionalization of teachers

through improved professional growth, practices in teaching, and increased achievement of students.

Operational Definition of Terms

This study deals with the summer upgrading program at colleges of teacher education and its impact on improving teachers' professional growth and students' achievement. Accordingly, the following operational definitions of terms are focused on in the study.

- *Summer upgrading program* - a teacher development program offered as an in-service and conducted every summer (July to September).
- *Professional growth* - indicates the overall competence of the teachers.
- *Student achievement* - is a test score largely score obtained in the national level examination.

Review of Related Literature

Teacher Education and Transcending Effects

Teacher Education

Across the globe, there are several teacher education modalities (Aklilu et al., 2008; Solomon 2008; Kassa, 2014). Some believe in the development of content knowledge as the sole cause for the design of teacher education; others approach the issue in various ways such as pedagogical, pedagogical content knowledge, theory-practice interface, and the like (Kassa 2014; Solomon, 2008). The Ethiopian primary education teacher education program is designed with a structural approach where the new pre-service program prepares teachers for lower and upper primary teaching in two programs – cluster and linear; and integrating theory (content and professional) and practicum (MoE,

2013). The cluster level prepares teachers in a composite of three subject areas - plus common, professional, and practicum courses - for teaching in lower primary grades 1-4. The linear level prepares teachers in a major and minor subject - plus common, professional, and practicum courses - for teaching in upper primary grades 5-8 (MoE, 2013).

Teachers Matter

It is widely recognized that teachers are among the indispensable entities in education, specifically in the effect teachers have on student learning. Among classroom components, the role of the teacher and his/her management style is highly important and crucial for the success of the students' educational objectives (Esmaeili et al., 2015). Every teacher and every school are subject to their unique conditions, and what worked for one group of students cannot be assumed to work for a different group (Segolsson & Hirsh, 2019) implying the significance of the role of teachers. Though the role of teachers has been indicated, it is equally debated that *measurable characteristics such as teacher experience, education, and even test scores of teachers explain little of the true variation in quality* (Rivkin et al., 2005, p.422). In contrast, the quality of a teacher operationalized via qualifications such as teacher education level, job experience, and participation in professional development activities, as well as by teacher characteristics such as self-efficacy (Nilsen & Gustafsson, 2016) has indicated that teacher quality is of importance for student achievement in several studies (Blömeke and Delaney 2014). This is also supported by David (2016) who states a moderate to a strong relationship between teachers' knowledge of math and the way that this content is enacted in the classroom. This indicates that good teacher knowledge manifests itself in good classroom practice. Thus, an upgrading program that equips with grounded teacher knowledge improves classroom practices, and hence learner outcomes.

The arguments discussed above indicate that it is not only valid to check if teachers matter, but also what characteristics of the teachers really matter and significantly affect students learning. Some of the research on the effect of teachers were also propelled by the need for policy and strategy to make teachers accountable and justify teacher development. Rivkin, et al., (2005, p.422) state that there is *...a growing consensus by most researchers that schools and teachers matter though there is a difference in how much they matter and whether measurable characteristics such as teacher education and experience affect student educational outcomes*. They further state that student *... achievement gains are systematically related to observable teacher and school characteristics, but the effects are generally small and concentrated among younger students* (p.449-450). Similarly, Dada (2016) states that *non-school factors do influence student achievement, but effective teaching has the potential to help level the playing of such factors* (p.52).

Sanders and Rivers (1996) (Dada, 2016) also state that the positive effects of teacher quality are cumulative: for example, a 5th-grade math student who had three consecutive highly effective teachers scored between 52 and 54 percentile points ahead of students who had three consecutive teachers who were least effective even though the math achievement of both groups of students was the same before entering the second grade (p.53).

Mohammed and Yusuf, (2015) in Dada (2016) also recognize that many factors contribute to a student's academic performance, (including individual characteristics, family, and neighborhood experiences) but the researchers underscore that *... when it comes to student performance in reading and math tests, a teacher is estimated to have two or three times the impact of any other school factor, including services, facilities, and even leadership*.

Similarly, Nye et al., (2004) state that teacher effects are greater than school effects and advise that working more on changing the quality of

the teachers or replacing them with effective teachers would benefit more than changing or reforming schools. These researchers provide evidence by stating that:

if teacher effects are normally distributed, the difference in achievement gains between having a 25th percentile teacher (a not-so-effective teacher) and a 75th percentile teacher (an effective teacher) is over one-third of a standard deviation (0.35) in reading and almost half a standard deviation (0.48) in mathematics. Similarly, the difference in achievement gains between having a 50th percentile teacher (an average teacher) and a 90th percentile teacher (a very effective teacher) is about one-third of a standard deviation (0.33) in reading and somewhat smaller than half a standard deviation (0.46) in mathematics. ...These effects are certainly large enough effects to have policy significance. (p. 253).

Boyd et al., (2009) in Goldhaber et al., (2013, p. 429) found that a one standard deviation change in the effectiveness of the teacher preparation program corresponds to more than a third of a standard deviation in the teacher effect for new teachers. Goldhaber et al. (2013) who usually favor teacher assessments through actual classroom performance rather than pre- or upgrading credentials, recognize the difference in the effectiveness of the teachers credentialed by various programs. They state that *... the regression-adjusted difference between teachers who receive a credential from the least and most effective programs is estimated to be 3.9–13.4% of a standard deviation in math and 9.2–22% of a standard deviation in reading*. Bitler et al., (2019) stated that the increased availability of data linking students to teachers has made it possible to estimate the contribution teachers make to student achievement. Bitler (2019) citing (Hanushek & Rivkin 2010; Harris 2011; Jackson, Rockoff, & Staiger 2013; Koedel, Mihaly, & Rockoff 2015) indicated that by nearly all accounts, this contribution is large and estimates of the impact of one standard deviation (σ) increase in teacher "value-added" on math and reading achievement typically range from 0.10 to 0.30σ, which suggest that a student assigned to a

more effective teacher will experience nearly a year's more learning than a student assigned to a less effective teacher. These highlights the importance of the teachers and their roles. From a slightly different perspective, Blömeke, Olsen, and Suhl (2016) state that though teacher quality should matter, the degree of its influence may vary depending on teacher quality indicators or among educational systems. Harris and Sass (2006) in their turn reduce the importance of the teacher focusing on student and parent contributions to student learning and achievement. They further noted that the most important contributors to student learning are arguably the students themselves. Despite the contending positions about the effect of teachers on students' achievement, the summer upgrading program in Ethiopia believes that if teachers are allowed to upgrade from a certificate in teaching to a diploma in teaching by taking several courses, they will be better professionals who can improve their teaching practices and influence the achievement of students.

Teacher's Professional Growth and Impact on Student Achievement

As noted earlier, teacher effectiveness has been hailed as one of the strongest predictors of student learning and achievement. In fact, among the school-related variables, the effect of teachers accounts for two or three times more than any other school factors (Mohammed and Yusuf, 2015). Boyd et al., (2009) also found that *a one standard deviation change in the effectiveness of the teacher preparation program corresponds to more than a third of a standard deviation in the teacher effect for new teachers* (as in Goldhaber et al., 2013, p. 429).

Aaronson et al., (2007) found consistent results with earlier studies that teachers are important inputs in ninth-grade math achievement. Namely, after controlling for initial ability (as measured by test scores) and other student characteristics, teacher effects are statistically important in explaining ninth-grade math test score achievement, and the variation in teacher effect estimates is large enough such that the expected

difference in math achievement between having an average teacher and one that is one standard deviation above average is educationally important.

Though there are still unsettled arguments on the effect size of the contribution of teacher effect to student learning and achievement, the overarching policy of governments and educational systems seems to favor investment in improving teacher quality to enhance teacher effectiveness and student achievement - hence teacher development and their strengthened practices.

In line with this overarching perception of staff development, the Tigray Bureau of Education conducted a large project aimed at enhancing teacher quality by upgrading teacher profiles. The program aimed at upgrading certificate-holding teachers into a two-year diploma program. To date, the program graduated close to 10,000 teachers, and yet the effectiveness of the program, in terms of competence, professionalization, and effect in improving students' achievement, has not been studied. This study tries to investigate the perception of the trainee on the overall effectiveness of this program in their professional career development including both subject matter and professional knowledge cultivation of trainees, and the effect of such an upgrading program on student achievement in grade eight over a period of five years.

Statement of the Problem

Following the launching of the teacher education blueprint and curricular framework (MoE, 2008; 2013), it is assumed that if teachers are upgraded from a certificate to a diploma, there will be an improvement in the quality of education and the achievement of students. However, the achievement of students is not only failing to improve but it has also shown a declining pattern as described in the national learning assessments of Grades 4 and 8 (NEAEA, 2016). Hence, it is essential

to see whether the upgrading program brought a positive effect on teachers' professional growth and students' achievement and whether other factors such as the provision of education in the CTEs, school environment, and leadership account.

Research issues

- How graduates of the summer upgrading program perceive the overall impact of the training on their professional growth;
- Whether there is a relationship between the summer upgrading program and actual student achievement progress;
- Whether the upgrading program brought about significant change in student achievement, and end up in filling differential achievement of boys and girls; and
- Whether the effect on achievement is consistent across zones or there is a differential achievement across zones.

Objectives

The overall objective of this study is to investigate if the summer upgrading program of teachers is perceived positively by the trainees in enhancing their professional development and to see if it is resulting in enhanced student learning as measured by student achievement in the eighth-grade national exams of the regional state. Based on this major objective, the study focused on:

- investigating the perception of graduates on the impact of training on their professional growth;
- investigating if there is a significant relationship between the summer upgrading program and the actual student achievement progress;
- investigating if there is steady progress on overall student achievement at grade eight beginning the years of graduation of the upgrading program, and if the training has mitigated differential achievements based on gender; and

- investigating if the upgrading program has enabled a higher score achievement and whether the effect on achievement is consistent across zones.

Methods

Study Design

A study design serves as a plan that guides the researcher to connect the empirical data to a study's initial research questions and eventually to the answers to the questions set (Yin, 2003). This study investigates the perception of trainee teachers on how the summer upgrading program impacted their competence and professional growth and its effect on improving student achievement. To do this, a survey design is used to collect the necessary data. Surveys are used to collect information about people to describe, compare, or explain their knowledge, feelings, values, and behavior (Fink, 2013). In addition, this study tries to investigate if there is a significant relationship between the summer upgrading program and the actual student achievement progress at schools. Based on this, the study has employed a correlational survey design. Quantitative methods are employed to measure the associations. This research is also conducted based on a cross-sectional survey design where data are collected at one point in time.

Population, Sample, and Sampling Technique

This study focuses on those teachers who attended the summer upgrading program. Hence, it considered those who completed the summer upgrading program in the years 2013 up to 2017 in Tigray Regional State. All upgraded teachers in those time ranges were considered targets for this study. The upgraded teachers are targeted because these are the ones who can inform about the effect of the upgrading program on their professional growth, and make it feasible to assess the effect on students' achievement. In other words, for survey

research, it is crucial to determine an appropriate and representative sample size to ensure acceptable data collection. To this effect, using the minimum sample size formula for simple random sampling developed by Cochran (1963), for a 95% confidence interval at a 5% margin of error and by employing the formula $n \geq \frac{Z_{\alpha/2}^2 pq}{\varepsilon^2}$ p=q=0.5, z=1.96, including the consideration of the optimal values for the proportion of response of interest, the sample size used for this study was 514 teachers. These teachers were selected from the five zones of the seven zones of Tigray regional state and two woredas of each selected zone. The five zones were selected randomly from the seven zones. Two woredas from each of the five zones and schools from the selected woredas were also selected using a simple random sampling technique. Lists of all teachers who were upgraded from a certificate to a diploma through the summer in-service upgrading program and who were currently teaching in the selected primary schools (first and second cycle, grades 1-8) were included in the study as a sample.

Table 1: *Composition of the respondents involved in the study for the gathering of quantitative data, selected from the different zones and woredas (districts)*

Zone	Woreda	Frequency	Percent from 514
Mekele	Total	101	19.6
Central	Adwa	54	10.5
	Lailay Maichew	50	9.7
	Total	104	20.2
Eastern	Adigrat	56	10.9
	Kilete Awlaelo	51	9.9
	Total	107	20.8
South East	Enderta	50	9.7
	Hintalo-wajerat	50	9.7
	Total	100	19.4
North West	Medebay Zana	50	9.7
	Shire	52	10.1
	Total	102	19.8
Grand Total		514	

Table 1 presents the number of teachers from each zone involved in the study. From this, one can see that each zone was represented adequately and that there was an even distribution of respondents across zones.

Table 2. *Composition of respondents by sex, and by the CTE in which they attended the summer in-service upgrading program*

Sex	**Frequency**	**Percent**
Female	347	67.5
Male	167	32.5
Total	514	100.0
CTE attended		
Abi Addi	237	46.1
Adwa	277	53.9
Total	**514**	**100.0**

From Table 2, we see that the number of female teachers was more than almost double that of males, but due to affirmative action, the enrollment of female teachers in the upgrading program and those who were found in the sample schools revealed the number of female teachers to exceed their counterpart male teachers. It further shows that the teachers included in this study represent both fairly and evenly in both colleges.

For such a study, the teachers' educational field of study is an important factor for measuring effectiveness. Due to this fact, it was felt important to consider the inclusion of teachers from each of the fields of study. Table 3 shows the composition of teachers concerning their educational fields.

Table 3. *Participant Teachers by Field of Study and Service Year*

Field of study	Frequency	Percent
Languages	152	29.6
Science & Math	239	46.5
Social Science	123	23.9
Total	**514**	**100.0**

An attempt was made to dissociate the upgraded teachers by their field of study and by their service year. All in all, there were three cluster areas as indicated in Table 3. Table 3 shows the teacher respondents represent all the fields of the study found in primary schools as clusters. The fact that science and math teachers were higher in percentage was due to the higher proportion of science and math teachers compared to other subjects, as a consequence of the 70:30 professional mix that stands in favor of science and technology – 70% enrollment to science and technology.

Variables

The study was conducted to explore the effectiveness of the summer upgrading program on the professional development of the trainee teachers and on students' achievement. To this effect, several variables were considered. The variables included in this study included CTE-level variables, school-level variables, and personal-level variables. These include courses, instructional skills, and facilities at the CTE level; teaching-learning at schools and school environment were the variables considered at the school level; and teachers' professional growth and students' achievement at a personal level.

Data Collection Instruments

Since gathering data using one method would be insufficient to address the intended objectives, a cumulative view of data drawn from different

instruments was essential. Thus, this study required multiple data-gathering tools. Accordingly, a survey questionnaire consisting of 24 closed and open-ended questions (related to background and practical implementation) was used. 31 items of a Likert scale related to CTE training and 21 items related to school practice (having six open-ended questions) were also used. Classroom observation with 44 items and two open observation narration guides were utilized. Finally, key informant interview questions consisting of eight pillars and focus group discussions with guiding questions were employed to gather data related to Teacher Development Program (TDP). All the data-gathering tools were developed by the researchers.

Reliability and Validity of the Instruments

The instruments used for this study were initially piloted at different schools. Accordingly, Cronbach's alpha value for the survey was found to be 0.76 classified into two: implementation at the CTE level with 31 items (alpha value of 0.74) and implementation at the school level with 21 items (alpha value of 0.81); and the school observation with 44 had an alpha value of 0.82. Each value of alpha indicates that each of the tools was in the acceptable range for internal consistency reliability. The details are as follows.

Table 4. *Cronbach's Alpha Values of Reliability*

Categories	Variables	No of Items	Alpha value
Implementation at college of teacher education level (31 Items), Alpha = 0.74	The in-service upgrading program	11	0.75
	Courses in the in-service TDP one has attended	6	0.69
	Instructional skills employed in the in-service TDP one has attended	6	0.74
	Facilities available in running in-service TDP one has attended	8	0.76
Implementation at School level (21 items), Alpha = 0.81	Teaching-Learning at schools (post-in-service Program),	12	0.82
	School environment and Leadership	9	0.78
Classroom Practices (44 items), Alpha = 0.82	Introduction of the Lesson, Lesson objectives, Lesson Activities, Subject Mastery (Knowledge), Teaching Aids and Other Resources, Student Assessment, and Classroom Management	44	0.82

For both the interview and FGD tools double recordings were performed and agreement between the recorders was checked. Though validity might be improved through careful sampling, appropriate instrumentation and appropriate statistical treatments of the data (Cohen et al., 2007) were attentively followed. Given the sampling approach used for this particular research, validity issues entrusted by this research were given due emphasis for the instruments through construct validity, face validity, and content validity by involving and incorporating literature support and validation by both content and pedagogical experts.

Data Collection Procedures

After piloting the instruments an online data management system that provided a unique opportunity for data quality management was developed. Data collectors were recruited based on their relatively high level of academic qualification (and with a background in education); their experience in similar data collection processes; and their fluency in the medium of instruction in the primary schools of Tigray (local language, Tigrigna). Providing sufficient training regarding the instruments and the data collection requirements, the enumerators were

made to know what was expected of them. Trained supervisors were also involved to follow and guide the execution of the data collection. A questionnaire in an online system to be filled through a one-to-one modality was delivered, and data was collected accordingly. Furthermore, 194 lessons in social studies, environmental science, mathematics, and languages were observed using checklists prepared for this purpose. Those observed were teachers who had gone through the summer in-service upgrading program and had participated in responding to the questionnaire. Similarly, 80 participants were included as key informants in the study for the gathering of qualitative data.

Methods of Data Analysis

The data collected for this study were analyzed following each leading question. Descriptive and graphical presentations of data were made to seek patterns. Further analysis and proper statistical techniques such as ANOVA and independent samples t-test were also utilized for comparison purposes. Correlational analysis was also conducted for the strength of association between the professional development of the upgraded teachers and that of students' academic achievements, and Chi-square was utilized to test the goodness of fit. For each of the tests, assumptions such as normality and homogeneity of variance for the t-test and ANOVA, and count on each of the cells for the Chi-square were explored and were found to be fulfilled.

Results and Discussion

This part will discuss empirical data collected to answer the forwarded research questions. Perception of teachers on the overall gains from the training, the relationship of training impact with student scores, and the differential impact of the training on gender and zonal variation are discussed below.

Table 5. *Comparison by scales of variables between males and females at CTEs and school-level variables*

	Variable	Gender	n	Mean	SD	t	df	P
CTE Related	Programs at CTEs	Females	347	4.22	0.489	2.532	512	.012
		Males	167	4.10	0.514			
	Courses at CTEs	Females	347	4.25	0.477	1.987	512	.047
		Males	167	4.16	0.494			
	Instructional Skills at CTEs	Females	347	3.86	0.494	2.289	512	.022
		Males	167	3.75	0.522			
	Facilities at CTEs	Females	347	3.77	0.635	1.156	512	.248
		Males	167	4.18	0.675			
School related	Teaching-learning at schools	Females	347	4.18	0.418	2.636	512	.009
		Males	167	4.08	0.419			
	School environment	Females	347	3.95	0.541	2.694	512	.007
		Males	167	3.81	0.566			

Table 5 shows that except for facilities at the CTEs, all variables were found to differ significantly concerning sex, with females largely having a favorable response more than their male counterparts. This significant difference raises the issue of why female trainee teachers had better ratings than male trainees. The difference is significant, and the overall rating was above 3.75, which is above average.

As pointed out previously, school-related factors are critical determinants of teachers' effectiveness in practicing what they gain during the summer in-service upgrading program. A baseline comparison was made to see zonal differences in this regard, the result of which is provided below.

Table 6. *Comparison of Responses by Level and Component Variables concerning Zones*

		Sum of Squares	Df	Mean Square	F	Sig.
CTE vs School						
CTE level	Between zones	11.128	4	2.782	17.638	.000
	Within zones	80.282	509	.158		
	Total	91.410	513			
School level	Between zones	8.023	4	2.006	13.635	.000
	Within zones	74.875	509	.147		
	Total	82.897	513			
Component Variables						
Summer upgrading program at CTE	Between groups	28.820	4	7.205	36.894	.000
	Within groups	99.402	509	.195		
	Total	128.222	513			
Courses at CTE	Between groups	6.401	4	1.600	6.609	.000
	Within groups	123.244	509	.242		
	Total	129.645	513			
Instructional skills at CTE	Between groups	4.022	4	1.006	4.029	.003
	Within groups	127.027	509	.250		
	Total	131.049	513			
Facilities at CTE	Between groups	12.616	4	3.154	7.895	.000
	Within groups	203.336	509	.399		
	Total	215.951	513			
Teaching-learning at schools	Between groups	8.701	4	2.175	13.491	.000
	Within groups	82.074	509	.161		
	Total	90.775	513			
School environment	Between groups	15.460	4	3.865	13.935	.000
	Within groups	141.179	509	.277		
	Total	156.639	513			

Table 6 presents the result of the analysis of variance among zones. The results show that the difference among zones is significant, both in terms of their views towards training at the CTEs $F (4, 509) = 17.638$; $p = .000$, and their practice in schools $F (4, 509) = 13.635$; $p = .000$.

These results show that the teachers trained at the CTEs differ in their perceptions of the overall organization of the summer upgrading program. This was measured in terms of the training program, the training courses, instructional skills, and facilities. They also differed in

terms of abilities gained at the CTEs, and in their practice in schools. To help identify the zonal differences, post hoc analysis for pairwise comparison of zones depicts the following results.

Table 6 further depicts that in all the variables there is a statistically significant difference among the zones. If there is such a difference between zones, could the field of study account for this difference? This was tested and the results reveal that field of study did not show any significant difference both at the CTE level ($F = 1.48$, $p = .229$) and at the school level ($F = 2.15$, $p = .117$). These trigger further questions such as 'what else could cause the differences?' and these need further research looking into other variables such as the language of instruction, contextualization, leadership in the zones, etc.

Patterns of the Academic Results of Students: Pre-During-Post Training

From the descriptive results presented above the majority of teachers had the position that the upgrading training has helped them improve their practice in class and students' academic achievement. Ideally, if upgrading impacted better student achievement then the pattern in aggregate of the student achievement has to show an increment. To help reveal the pattern of this academic achievement of students' data from the regional state's grade eight examinations were collected. The description of the scores grouped into four categories and the number of students lying in each of the score categories are presented below to help seek the pattern.

Table 7. *Grade Eight Scores and Students Statistics by Year and by score categories*

	No. of students who took the exam			Score [50-75)			Score [75-85)			Score >=85			% Score ≥ 50
Year	M	F	T	M	F	T	M	F	T	M	F	T	
2010	32032	37445	69477	21987	21686	43673	1236	509	1745	92	17	109	66%
2011	39876	45913	85789	27125	27077	54202	1755	906	2661	130	21	151	66%
2012	45719	52501	98220	32079	34819	66898	2411	1398	3849	330	78	408	72%
2013	44132	49101	93233	32081	34068	66149	2360	1449	3809	225	68	293	75%
2014	46232	49553	95785	31660	32512	64172	1510	825	2335	96	25	121	70%
2015	50186	53328	103514	38496	38853	77349	1210	762	1972	47	23	70	77%
2016	51117	53466	104583	42244	43770	86014	2618	1980	4598	87	37	124	87%

Table 7 presents the score categories and student statistics. From Table 7, one can see that the proportion of students whose academic achievement exceeds 50 (inclusive) increased from year to year which is promising as manifested by a declining pattern of students whose score is below 50. But, the proportion of those students who scored more than 75 (inclusive) is much less ranging between 2% - 5% despite the ever-increasing number of students who sat for the exam. The pattern of variation shows that the proportion of students with a score above 50% was increasing across the years with a 7% increase from 2014 to 2015 and a 10% increase from 2015 to 2016 which is promising. If this increment is sustained, it would mean there will be a great strand of success in time. But, the increment of the proportion of scores above 75 was shown to be -1% from 2014 to 2015, and a 3% increment from 2015 to 2016, which still seeks attention. Despite these gross comparisons, sex was also treated as a category for comparison. The pattern is presented below showing consistently a similar pattern.

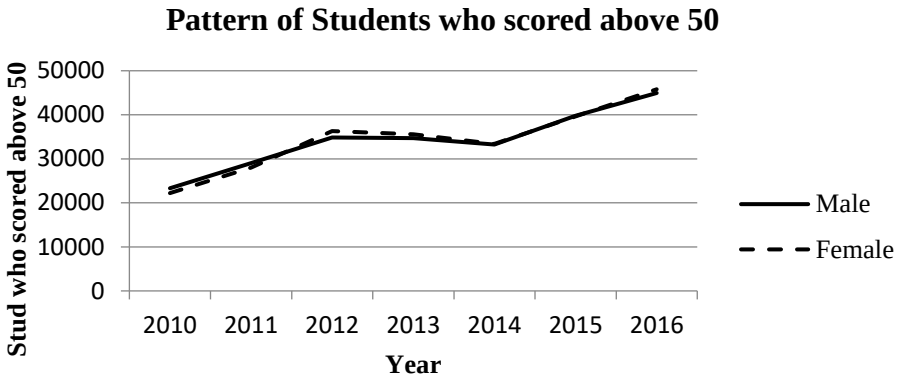
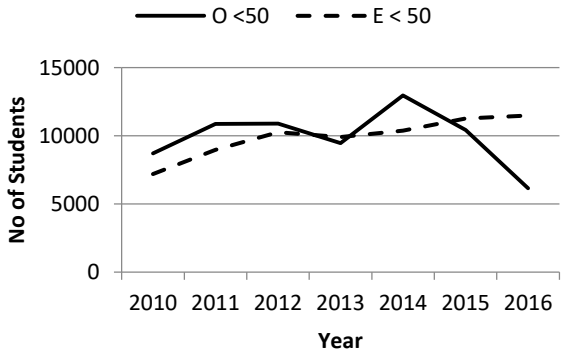
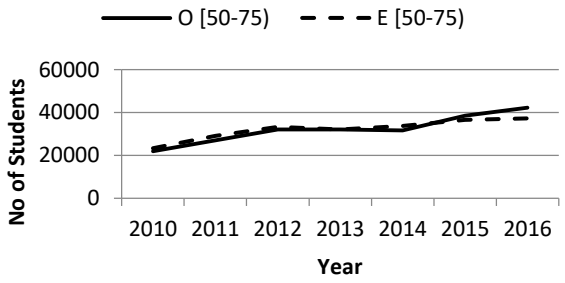


Fig. 1. Comparative pattern of Male and Female students who achieved more than 50%

In pursuit of the descriptive presentations outlined above, the extent of the observed results was compared to whether they fit expectations. In so doing the comparative description of the observed and expected frequencies for each of the score categories is presented below with the chi-square test of goodness of fit.


O <50
E < 50
15000
10000
5000
0
No of Students
2010 2011 2012 2013 2014 2015 2016
Year


O [50-75)
E [50-75)
60000
40000
20000
0
No of Students
2010 2011 2012 2013 2014 2015 2016
Year

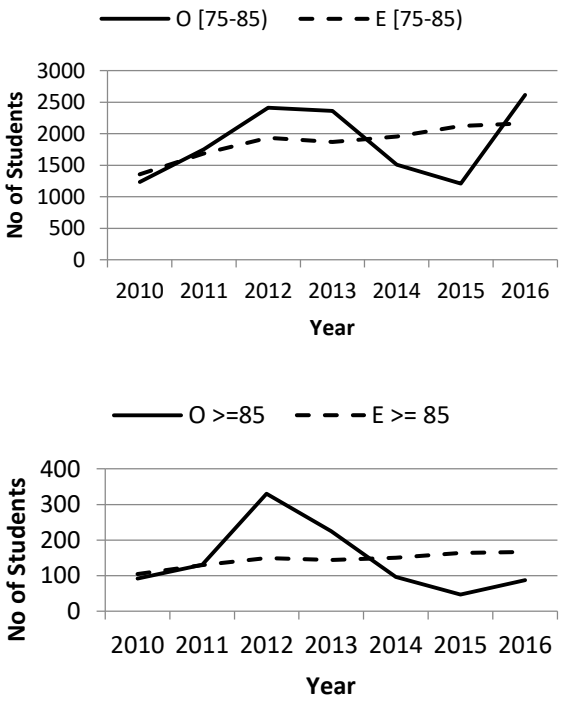


Fig.2. Comparison of Expected versus Observed scores of students for each score category

The chi-square result was computed to be χ^2 = 6352.31, with the tabulated value of $\chi^2(24, .05) = 36.42$ depicting a significant difference between the expected and observed values. Especially in the score categories of 75 and more at which the observed frequencies are significantly less than the expected frequencies, especially in the years 2014 to 2016.

These reveal that there is steady progress concerning student achievement, as explained by scores greater than 50, which happened to increase from 2010 to 2016 following the graduation of the trainees.

Contrary to this average of 50, students who scored an average of 75 and above did not follow suit. There is a decline of -1% and a meager increase of a 3% maximum.

Conclusions

The findings here challenge the primacy of the view that a sufficient training program alone can lead to a significant impact in schools. Additionally, if teachers are more likely to exhibit competence and increased enthusiasm, one would say that the joint consideration of in-service training in CTEs and of continued engagement in schools is a critical paradigm that must be installed, to ensure that the upgrading training is effective. It is also noted that the zonal variation of the opinions of teachers on the program's effectiveness indicates that there are factors that account beyond the effect of the upgrading training. It is, hence critical to explore potential causes and mitigate sources of variations. However, upgrading training alone is not sufficient to ensure continued professional growth and effectiveness. Post-graduation quality monitoring and accreditation programs need to be in place that includes packages of benefits to creating positive motivation and subject mastery on the side of teachers. Lastly, the program contributed towards improving the achievement of the average students, but not that significantly for those high-level achievers. Hence, one would conclude the competence of the teachers is not at a higher level to extend the learning of high achievers. This seeks the need for teachers to be engaged in continued professional development.

Recommendations

Based on the findings and the conclusion presented the above, the following recommendations are forwarded:

- Mechanisms need to be put in place to ensure that upgraded teachers demonstrate continued engagement in their schools through the development of professional development packages;
- Since CTEs cannot fully equip teachers, to fill gaps that could not be covered at the CTEs during teacher training, there is a need to install school-based CPD – such as identifying contents from the school curricula and filling these in the school-level CPD;
- Since the workplace situation was found to be significant concerning teachers' demonstration of their competence, there should be a mechanism, such as parallel planning to align the workplace situation and the upgrading programs;
- Since maintaining a conducive school environment is critical, special emphasis has to be paid to school leadership at least to ensure that they are instructional leaders, in addition to all the efforts they exert to make the learning environment appealing. To do so supervision and inspection packages need to be developed to support the action;
- Since all of the upgraded teachers were trained in the two CTEs available in the region, their practice, in terms of their competence at schools, might have been expected to be homogeneous. However, the results of this study reveal statistically significant differences between zones. This calls for a further review of the zonal practices that may have a link to the effectiveness of the program or the teachers' practices in schools. This calls for further detailed research;
- When building capacities there is a need to systematize follow-up mechanisms. Thus, it is wise to strengthen the experience the CTEs have started towards following the impact of their training programs. These can be done in ways such as including the follow-up systems and impact assessment part of the yearly plan so that it can be evaluated for effectiveness;

- Once teachers are upgraded, this should not be an end in itself. Tracking of career structure, for example, taking a certain number of credits each year, or other forms of professional development have to be in place for the effective implementation and impact of the upgrading program to be achieved; and
- Researchers show that professional development is most effective in promoting teacher learning when it addresses the teaching and learning of particular academic subject matter instead of general teaching principles. This entails the utilization of team teaching that will be useful for catering to specificities of expertise.

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