The impact of interventions on teachers' professional competence and students' academic performance in Ethiopia

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ABSTRACT

Background: Teachers' professional competence is a critical factor with a proven effect on student academic performance and, consequently, educational quality. *Objective*: This study investigates the impact of an intervention on teachers' professional competence and its subsequent effect on students' academic performance in Ethiopia. *Material and Methods*: Adopting a positivist worldview, a quantitative research approach, and a quasi-experimental design, data were collected using standardized scale tests from 60 teachers and 2400 students. *Intervention*: The experimental group of teachers received a half-day intervention training for 208 hours over two months, focusing on Grade 1-6 English subject standards due to the low achievement levels in these grades. *Results*: The findings revealed a significant correlation between teachers' professional competence, as measured by licensure tests, and teachers' professional competence and students' academic performance (r = .89, P < .001). *Conclusion*: Continuous learning and training opportunities equip teachers with updated knowledge, skills, and instructional strategies. Aligning teacher education curricula with competency standards and assigning teachers based on their qualifications is crucial for enhancing educational outcomes.

Keywords: Teacher, licensure, academic performance, teacher professional competence

INTRODUCTION

A teachers' professional competence license is a teaching credential that an individual needs to legally work as a teacher in particular area.[1] The Ethiopian National Teachers' Professional Competence Licensure Test (NTPCLT) is a test administered to prospective and serving professional teachers to check whether their general academic and professional knowledge and skills meet the required standards before their licensing.

The abilities, information, dispositions, and motivational factors that underpin situational mastery are referred to as teachers' professional competence.[2] In contrast, students' academic performance (SAP) is a measure of how well a learner has completed particular objectives that were the main focus of activities in educational settings, particularly in schools.[3] The academic and professional background of a teacher, along with their gender of a teacher, as well as their training, experience, age, and interval between assessments, all have an impact on the learning discourse of pupils and should all work together to ensure high-quality education. One significant element that has been shown to have an impact on student academic achievement and, consequently, educational quality is the professional competence of teachers.[4]

Teacher licensure tests can be high-expensive, but provide limited benefits if they lack validity and reliability. The teacher licensure standards and assessments need to strike a careful balance-setting, high standards, while not creating unnecessary barriers that deter qualified individuals from entering the profession

In Ethiopia, there are no strict policies, laws or incentives for instructors to take the licensure test or oversee the program with exception of the guidelines and framework for teachers and school administrators. Despite the fact that licensing and re-licensing should be prerequisites for career advancement, teachers

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are nonetheless hired and promoted without a teaching license.[5] The licensing tests for in-service teachers have been in place since 2015, but they have not been very effective. This suggests a lack of accountability and follow-through the testing, which undermines its purpose and credibility from the teachers' perspective. Regarding the challenges with teacher competency licensure tests and support in Ethiopia compared to other countries, there is a lack of resources and support to help teachers actually meet and develop these competency standards. If teachers don't have access to training, materials, and guidance on how to improve their skills, the standards become meaningless.

There has been substantial investment of public resources by the government to drive the licensing and re-licensing initiatives, with the objective of improving education quality. Teachers' own efforts and motivation to acquire the required licensure, indicate their willingness to participate in the process. However, the lack of achievement of the intended goals suggests there are systemic problems beyond just teacher effort. There is a breakdown in trust and finger-pointing between the government and the teachers. So, to understand where is the problem and who is responsible for it; needs a profound investigation. Thus, given these considerations the study was conducted to assess the impacts of intervention (training) on teachers' competence and students' academic performance in Ethiopia.

Conceptual Framework

Based on the theoretical framework, relevant literature, and empirical findings. The teachers' licensure test and the students' national learning assessment exam were used to measure teachers' professional competence and students' academic performance. In this study, the intervention (teachers' licensure test) was the independent variable (IV), while teachers' professional competence and students' academic performance were the dependent variables (DVs). Key intermediate variables included teacher-related factors (competence) and student-related factors (academic performance).

Objectives of the study

1. To investigate the relationships between teacher's TPCLT score, their professional competence and students' academic performance.
2. To examine the differences between experiment and control groups.
3. To access the differences between male and female teachers' in TPCLT scores.
4. To elaborate the differences between teachers who appeared and not appeared for TPCLT before the current research
5. To investigate the impacts of intervention of teachers' professional competence licensure test to teachers' competence and students' academic performance.

MATERIALS AND METHODS

Research Design: The researchers used a quasi-experimental design in order to assess the impact of the training (intervention) on teachers' professional competence (TPC) and students' academic performance (SAP).

Area of the Study: Ethiopia is one of eastern African nation in 9.1450° N and 40.4897° E, in the northern hemisphere above the equator. It has a total area of 1,100,000 Km^2 and its current population is 122,684,346.[7] The population density in Ethiopia is 115 per Km^2 (298 people per m^2). The 2022-2023 academic primary school students' enrolment is 16,300,000 (76%) that are learning in over 32,000 primary schools in twelve regions and two city administrations.[8] The study conducted in primary schools in Ethiopia from selected regions and city administration of Oromia and Somali regional states and Dire Dawa City administrations.

Sampling: Ethiopia was divided into three strata (city administrations, 'emerging' regions, and 'non-emerging' regions). Samples were drawn from two regional states (Oromia and Somali) and one city administration (Dire Dawa) using stratified simple random sampling. A two-stage cluster sampling was employed to select schools, teachers, and students by region and school location. The final sample included 5 zones, 15 woredas, 36 schools, 60 teachers teaching grades 1-6 and who registered for the 2023 Ethiopian National Teachers' Professional Competence Licensure Test and 1,440 grade four students.

Randomization: The researcher selected the Dire Dawa region as the experimental group, as it was more logistically feasible compared to the broader and more dispersed Oromia and

Somali regions that were used as control groups. Both the experimental and control groups received a pre-test to measure of the teachers' professional competence (TPC) and students' academic performance (SAP) before the intervention. The training (intervention) was then given to the experimental group. After the intervention, both groups received a post-test to measure any changes in the teachers' professional competence (TPC) and students' academic performance (SAP).

Intervention: The intervention aimed to improve the professional competence of teachers, focusing specifically on the English subject. This focus was chosen based on findings that the lowest student achievement occurred in the primary first cycle (Grades 1-6), particularly in English. The intervention consisted of 208 hours of training over a 2-month period, with half-day sessions delivered by an English subject instructor.

Data Analysis: The researchers employed a variety of statistical tests to analyze the data, including frequency analysis, variance analysis, mean and standard deviation, one-way ANOVA Pearson product-moment correlation, paired sample t-test, independent sample t-test, and linear regression analysis.

RESULTS

After being evaluated for eligibility, sixty (60) teachers were included in the study. Twenty (20) of the sixty teachers were employed as experiment groups, and the remaining forty were used as control groups. Concerning students' participants, five children became sick after they had been screened and two other children leave the school. The remaining 1433 of 1440 (99.5%) children were considered for the data analyses along with all randomized teachers in both groups. The study had no negative effects on any of the teachers in any group.

Demographic Information of Respondents

The total number of teachers participated in this study were 60, from which 58.3% (35) were male and 41.7% (25) were female. The sample of students included 716 (49.9%) females and 717 (50.1%) males, for a total number of 1,433 students. The teachers age categories were from 25 and above, where as their experience was from 5 to 35.

Among the seven categories of experiences (0-5 to 35), the highest scores were achieved by teachers who had more than 21 years of working experience than below twenty years. In all the five department the highest scores (63.5) were achieved by English subject teachers, teaches English than other subjects teachers teach English.

Table 1. Respondents' Demographic Profile

Students'	
Variable	**%**
Sex	
Male	50.3
Female	49.7
Teachers'	
Variable	**%**
Age in years	
25-30	30
31-35	36
36-40	18
41-45	3
>45	15
Gender	
Male (M)	58.3
Female (F)	41.7
Experience in years	
5-10	23
11-20	61
21-30	8.3
30-35	6.6
Department	
English (Eng)	45
A/O	15
Amharic (Amh)	6.6
Somali (Som.)	10
Others	25
Career Ladder	
Beginner	5
Junior	5
Senior	20
A.L. Teacher	10.3
Lead Teacher	56.7

Relationship of teachers' professional competence licensure test and their professional competence and students' academic performance

Table 2. Relationships of teachers' professional licensure test score and their professional competence and students' academic performance Pre-test

Variable	TPC@	SAP$
Teachers' HEIs CGPA# +SBPE##	.896**	.886**

**Correlation significant at the 0.01 level (2-tailed)
#HEIs CGPA - higher education institution cumulative grade points
$Students' academic performance
@Teachers' professional competence
School Based Performance Evaluation

Table 2 above indicated that, there was a significant positive connection (r = 90, n = 60, p<.05) between the professional competence licensure test score of teachers and their professional competence. Here, the R^2 was calculated to determine the percentage of variability that the license test shares. The correlation between these two variables was 0.90. R^2 will therefore, have a value of $(.90)^2 = 0.81$. Consequently, approximately 81% of the variation in teachers' professional competence is found in the professional competence licensure test.

A positive association between the academic achievement of students and the professional competence of teachers, with a Pearson correlation coefficient of r =.89, n = 60, P < 001. Thus, it was established that there was a highly significant positive correlation between students' academic performance and teachers' professional competence.

The pre-post-test differences between experiment and control groups

The group who took training (intervention) had a mean of 60.75, in pre -test and 63.85 in the post test, the Oromia regional state control group one had mean score of 60.85 in pre-test and 64.00 in the post test as well as Somali regional state control group two had a mean of 53.20, in pre-test and 55.20 in post-test.

There were no significance differences between Dire Dawa and Oromia regional state but significance differences between Dire Dawa, Somali regional state and Oromia and Somali regional state, F (2, 57) = 2.48, P < 0.93, η^2 = 0.08 for pre-test and F (2.57) = 3.56, P < 0.35, η^2 = 0.11 for post- test respectively.

The differences between male and female teachers in both Tests

The P- value for pre-test was 0.725 which is greater than 0.05 and the P- value for post –test was 0.858 again larger than 0.05. Male and female were not statistically significantly different in both tests with mean of 60.16 for female and 59.27 for male. This difference was not statistically significant (58) = 0.924 p > 0.05. In essence, the findings challenge gender stereotypes by demonstrating that female teachers are just as capable as their male peers, at least in terms of the competencies measured by the licensure tests. This underscores the importance of providing equal opportunities and support for women in the teaching profession.

The differences between teachers who took national licensure test before the current research and those who never took

The statistical analysis using the t-test, p-values, and confidence intervals, indicate that there was no statistically significant difference in the mean test scores between the teachers who had taken the national licensure test before the current research and those who had not. The mean scores were 58.07 vs. 57.93 for the pre-test, and 60.85 vs. 60.54 for the post-test, but these differences were not large enough to be considered statistically significant t (56) = 0. .647 p > 0.05 in pre –test and 0. 544 p > 0.05 in post-test score. Addressing this perception through policy changes or other measures could help reinforce the importance of the licensure process (Figure 1).

Figure 1. Mean test score for who took test and not took
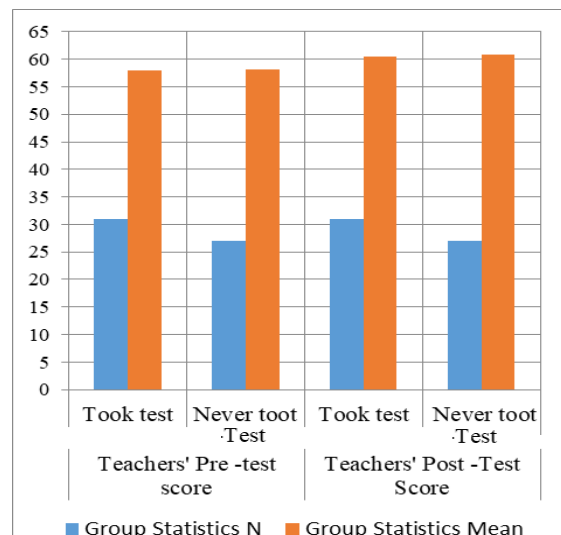
The experiment groups' test scores before and after intervention

Table 4. The paired sample t-test scores for experiment groups time 1 and time 2

		Mean ± SD	t	Sig.
Pair 1	Pre-test	60.26±12.24	21.457	.000
Pair 2	Post-test	63.21±11.49	23.986	.000

Table 4 indicates that the mean for teachers' pre-test score (time 1) was 60.26 and the mean of time 2 was 63.21. Therefore, it could be said that, there was a significant increase in teachers' scores from time 1 (prior to the intervention) to time 2 (after the intervention). There was a significant difference in experiment group teachers' both tests, by taking the t-value (21.46 for pre-test and 23.98 for post-test) and the degrees of freedom (df=18), but it did not indicate much about the magnitude of the intervention's effect.

The eta squared value was nearly 1.04, indicating that, there was a large effect, with a substantial difference in the experiment group' test scores before and after the intervention. Therefore, based on a paired-samples t-test, there was a statistically significant increases in experiment group teachers test score of time 1 (M= 60.26, SD= 12.24) to time 2 M= 63.21, SD = 11.48, t (18) p = 21.46 and 23.98. The intervention was deemed effective, as it brought about measurable improvements in the teachers' competence, which then translated to better scores on the post-test.

The Impact of Intervention to Teachers' Competence

Table 5. The correlation matrix of the effect of intervention on teachers' test scores

Teachers'	Intervention Time
Post Test Scores	.308
Post Test Scores	.008

The correlation was significant at a .008 level (r = .308, p = .01), and the coefficient is small and so it looks as though our predictors are measuring different things (there is little collinearity).

The table 6 is the model summary which tells what the dependent variable (outcome) was and what the predictors were in a model. The model's value was .0095, which means that teachers' training intervention accounts for 9.5% of the variation in teachers' post-test scores.

Regarding adjusted R^2, the final model was small .0.095, .0079, .005 (about 0.5%), which account for approximately 0.5% less variance in the outcome. The value was very similar to the observed value of R^2 (.0.095) indicating that the cross-validity of this model was very good. So, the model causes R^2 to change from 0 to .095, and this change in the amount of variance explained gives rise to an F-ratio of 6.061, which was significant with a probability less than .001.

Table 7 shows the model the F-ratio was 6.061, which was very unlikely to have happened by chance (p .001). Based on the model, there was an assumption that errors in regression are independent; the assumption was likely to be met if the Durbin–Watson statistic was close to 2 (and between 1 and 3).

Table 8 shows the regression model, the b-values talk about the relationship between teachers post test scores and (predictor) training intervention time. For these data the predictors have positive b-values indicating positive relationships. The value indicates that as teachers training intervention time increases by one term, teachers' test scores increase by 0.03 points.

Table 9 shows the model the VIF values were all well below 10 and the tolerance statistics all well above 0.2. The average VIF was very close to 1 and this confirms that collinearity was not a problem for this model.

The residual statistics was also examined for extreme cases. It shows any cases that have a standardized residual less than 2 or greater than 2. The sample were 20 experiment teachers; therefore, it was reasonable to expect about 10 cases (5%) to have standardized residuals outside of these limits. In the above case, there were 12 cases (6%) that were outside of the limits: therefore, it was within 1% of what would expect. In addition, 99% of cases should lie within p 2.5 and so only 1% of cases to lie outside of these limits. From these cases, it was clear that two cases (1%) lie outside of the limits (cases -29.235 and – 30.388). Therefore, it appeared to conform to what would expect for a fairly accurate model. Most of 12 potential outliers have CVR values within or just outside these boundaries. The only case that causes concern was case -30.366 (again!) whose CVR was some way below the bottom limit.

Table 6. Model summary for the effect of intervention on teachers scores

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.308ª	.095	.079	11.945	.095	6.061	1	58	.017	2.190
a. Predictors: (Constant), Teachers Training Intervention Time										
b. Dependent Variable: Teachers' Post Test Scores										

Table 7. Model summary of ANOVA model fort the effect of intervention on scores

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	864.800	1	864.800	6.061	.017ᵇ
	Residual	8276.183	58	142.693		
	Total	9140.983	59			
a. Dependent Variable: Teachers' Post Test Scores						
b. Predictors: (Constant), Teachers Training Intervention Time						

Table 8. The Model Parameters of the impact of intervention test scores

Coefficients													
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	Constant	56.031	2.545		22.012	.000	50.936	61.126					
	Teachers Training Intervention Time	.03	.005	.308	2.462	.017	.002	.023	.308	.308	.308	1.000	1.000
a. Dependent Variable: Teachers' Post Test Scores													

Table 9. The Collinearity diagnostics of the effect of the intervention

Collinearity Diagnostics					
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions	
				(Constant)	Teachers Training Intervention Time
1	1	1.796	1.000	.10	.10
	2	.204	2.964	.90	.90
a. Dependent Variable: Teachers' Post Test Scores					

Confounding variables

The researcher investigated potential confounding variables to explain the other factors that might affects teachers' competence, students' academic performance, and lack of difference between the Dire Dawa experimental group and the Oromia control group.

It was identified that teachers' competence, age, experiences, qualification, job satisfaction had greater influence on teachers' professional development and students' academic performance.

Concerning the lack of differences between Dire Dawa experiment group and Oromia control group, the Oromia control group teachers had more favorable characteristics in terms of: Experience, 45% Oromia to 42.5% Dire Dawa, Qualifications 30.5% Oromia to 27.3% Dire Dawa, and Career ladder 45% Oromia to 40% Dire Dawa. So, despite the Oromia control group not receiving the intervention, their more experienced and qualified teachers, as well as their grade-level distribution, may have led to similar performance outcomes as the Dire Dawa experimental group.

DISCUSSION

The results of the relationships between teachers' test scores and competence, indicate a strong positive relationship between teachers' test scores and their professional competence.

This suggests that the achievement in the teacher preparation programs at higher education institutions is predictive of teachers' competence. These findings align with previous studies, which found a high and positive correlation between teachers' CGPA in their teacher education programs and their performance on the Licensure Exam for Teachers.[11] The findings reinforce the need for higher education institutions to continuously evaluate and enhance their teacher preparation programs to ensure that new teachers entering the profession are well-equipped to deliver high-quality instruction.

The results indicate a significant positive relationship between teachers' professional competence and their students' academic performance. These findings illustrate how investing in the recruitment, development, and retention of highly competent teachers should be a top priority for education systems. Research in Texas found that up to 40% of the difficulties in students' academic achievement and gaps could be explained by variation in TPC.[12] This suggests that the intellectual competence and capabilities of the teacher are a primary asset in determining the quality of teaching and, consequently, the academic achievement of students. Competent teachers possess the necessary qualities and abilities to effectively inspire and develop the latent capacities of their students. This highlights how critical high-quality teaching is for improving overall educational outcomes. These findings illustrate how investing in the recruitment, development, and retention of highly competent teachers should be a top priority for education systems.

The findings of the experiment revealed that there was a statistically significant increase in the test scores of the experiment group teachers after the intervention. The study highlights how targeted, well-designed professional development for teachers can have a meaningful, positive impact on their skills and knowledge, which benefits student learning outcomes. In line with this, the study identified that an intervention training and practice test-taking session increases the probability of passing standardized tests.[13] This indicates that the intervention training had a positive impact on the professional competence of the teachers. The teachers who received the training showed improvement in their test scores, suggesting that providing various in-service and professional development training for teachers is crucial. The study highlights how targeted, well-designed professional development for teachers can have a meaningful, positive impact on their skills and knowledge, which then benefits student learning outcomes.

The findings of the study indicated that there were no statistically significant differences between teachers who had taken the national licensure test before the current research and those who had never taken it. This means that the test results for both groups were not significantly different. This was may be due to that, teachers who had previously taken the licensure test may have had difficulty in difficulty in remembering of de- valuating the program. Addressing this perception through policy changes or other measures could help reinforce the importance of the licensure process.

CONCLUSION

Males and females were found to be correlated in both tests, suggesting that gender did not significantly influence test scores in terms of competence. Teachers who performed well academically during their higher education were more likely to demonstrate higher professional competence in the licensure test. The effectiveness and competence of teachers were observed to have a direct impact on the academic achievement of their students.

The intervention training provided to teachers had a positive influence on their professional competence. The 2022 teachers' professional competence licensure test was deemed average in terms of item difficulty. However, its reliability, content validity, and construct validity were identified as areas requiring modification and improvement.

The study revealed several issues within the structure, system, administration, and implementation of the teachers' and school leaders' licensing and re-licensing programs in Ethiopia. The effectiveness of the promulgated licensing and re-licensing program for teachers and school leaders in

Ethiopia was found to be limited. Although the program was announced in 2015, the certification rate at the national level remains at only 14%, indicating a significant gap between the planned and implemented processes.

Reccommendations for Policy

Continuous learning and training opportunities can provide teachers with updated knowledge, skills, and instructional strategies, enabling them to adapt to evolving educational needs and improve their teaching practices. Aligning curriculum modalities for candidate teachers in Higher Education Institutions with competency standards is crucial. Recruiting and selecting teachers based on their licensing certificate can help ensure that individuals entering the profession have met the necessary standards and possess the required competencies. Assigning teachers to specific grade levels or subjects based on their professional qualification level is important. Evaluating teachers based on their qualifications and the grade levels they teach can provide a comprehensive assessment of their performance. The test should be developed by responsible and accountable non-governmental agents. Preparing educational laws, proclamations, rules, and regulations at the national level is essential. Overall, these measures contribute to the enhancement of the education system, the professional development of teachers, and the overall quality of education provided to students.

Recommendations for Future Research

The present research suggests that not all barriers related to the Teachers' Professional Competence Licensure Test and teacher professional competence have the same potential to predict the outcomes of the TPCLT and TPC. Therefore, it would be appropriate to conduct a quantitative study of these barriers using inferential statistical techniques. Such an investigation would help estimate the predicting power and effect sizes of each of the identified barriers. Furthermore, there is a need for further investigation into the performance of teachers who have participated in the licensure test, regardless of whether they passed or failed.

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