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The Effect of Teachers' Professional Development and the Use of Learning Technology on Teachers' Professional Competence and Teaching Motivation with Gender Equality as a Moderating Variable

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Abstract. This study aims to analyse the effect of teacher professional development and the use of learning technology on professional competence and teaching motivation, as well as to examine the role of gender equality as a moderating variable. The study was conducted on 140 primary school teachers in Pule Subdistrict, Trenggalek Regency. The research approach was quantitative, using Structural Equation Modelling (SEM) based on Partial Least Squares (PLS) with the assistance of SmartPLS 4.0. The results of the study on the six main hypotheses showed that: (1) Teacher professional development had a significant positive effect on professional competence (T=4.977) and teaching motivation (T=3.985); (2) The use of learning technology has a significant positive effect on professional competence (T=3.567) and teaching motivation (T=3.120); (3) Gender equality is proven to significantly moderate and strengthen the effect of professional development on competence (T=2.560); (4) However, gender equality was not proven to moderate the effect of professional development on teaching motivation (T=1.250). The conclusion of the study is that the integration of technology and gender-inclusive training is crucial for improving teacher quality in semi-rural areas.

Keywords: Teacher Professional Development, Learning Technology, Professional Competence, Teaching Motivation, Gender Equality

1 Introduction

Improvements in the quality of basic education are highly dependent on the competence and motivation of teachers as the frontline of learning. In Pule Subdistrict, Trenggalek Regency, geographical challenges and accessibility often hinder the equal distribution of teacher quality. Rindrayani (2024) emphasises that teacher competence is not only shaped by academic qualifications, but is also influenced by internal motivation and work discipline built through a conducive professional environment [1]. However, field data shows that 56% of teachers in this region do not yet have adequate access to technology-based professional development.

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In the digital age, technology integration is an absolute necessity. Indrakusuma (2024) in his research proves that the use of smart app-based learning media can significantly improve the effectiveness of material delivery and student engagement [2]. This indicates that mastery of technology is no longer an option, but a core competency that teachers must possess.

In addition to technical factors, psychological and social environmental aspects also play a vital role. Kadeni (2025) highlights that teacher performance and competence are greatly influenced by emotional intelligence and workplace stability [3]. In the context of teacher demographics in Pule, which is dominated by women (67%), the issue of gender equality is relevant to examine as a variable that has the potential to strengthen or weaken the relationship between the training received and the competencies produced. This study aims to test this influence model by focusing on six main hypotheses.

2 Method

2.1 Type and Design of Research

This research uses an explanatory quantitative approach with a survey method to test the causal relationship between variables.

2.2 Population and Sample

The research population consisted of all 214 primary school teachers in Pule Subdistrict. The sample was taken using purposive sampling techniques, with 140 respondents meeting the inclusion criteria.

2.3 Data Analysis Techniques

Data analysis was performed using Partial Least Squares (PLS)-based Structural Equation Modelling (SEM) with the assistance of SmartPLS 4.0 software. Model evaluation was conducted in two stages: (1) Measurement Model Evaluation (Outer Model) to test validity and reliability, and (2) Structural Model Evaluation (Inner Model) to test hypotheses.

This study used an ex post facto quantitative approach. The population and sample consisted of 52 students in grades 3-6 at Pakel 2 Public Elementary School (saturated sample). The instruments consisted of questionnaires (for the variables of collaboration, independence, and self-confidence) and descriptive tests (for problem-solving skills). The data were analysed using multiple linear regression with the help of SPSS after meeting the prerequisite tests (normality, linearity, multicollinearity, heteroscedasticity).

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3 Results And Discussion

3.1 Measurement Model Evaluation (Outer Model)

The results of the validity and reliability testing of the instruments are shown in Table 1. All indicators were declared valid because they had a factor loading value > 0.70 and were reliable with a Cronbach's Alpha value > 0.60.

Table 1. Validity And Reliability Test Results

Variables	Code	Loading Factor	Cronbach's Alpha	Composite Reliability	Description
Professional Development (X_1)	X1.1	0.841	0.895	0.912	Valid & Reliabel
	X1.2	0.812			
	X1.3	0.765			
Learning Technology (X_2)	X2.1	0.836	0.880	0.905	Valid & Reliabel
	X2.2	0.795			
	X2.3	0.775			
Professional Competence (Y_1)	Y1.1	0.855	0.910	0.930	Valid & Reliabel
	Y1.2	0.830			
Teaching Motivation (Y_2)	Y2.1	0.821	0.875	0.902	Valid & Reliabel
	Y2.2	0.808			

Source: Data processed by SmartPLS 4.0 (2025)

3.2 Measurement Model Evaluation (Outer Model)

The strength of the influence between variables in the research model is visualised through the following SmartPLS output image:

Based on Figure 1, the predictive power of the model can be seen from the R-Square (R^2) value presented in Table 2.

Table 2. R-Square Value (Determination Coefficient)

Dependent Variables	R-Square (R2)	R-Square Adjusted	Impact Category
Professional Competence (Y_1)	0.685	0.678	Strong
Teaching Motivation (Y_2)	0.620	0.612	Moderate - Strong

Source: Data processed by SmartPLS 4.0 (2025)

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An R^2 value of 0.685 indicates that 68.5% of the variation in teachers' professional competence can be explained by the variables of professional development, technology, and gender moderation interaction.

3.3 Hypothesis Testing

Hypothesis testing was performed using the bootstrapping procedure. A summary of the test results for the six main hypotheses is presented in Table 3.

Table 3. Hypothesis Test Results (Path Coefficients)

Hypothesis	Relationship Path	T-Statistic	P-Values	Decision
H_1	Professional Development (X_1) → Professional Competence (Y_1)	4.977	0.000	Accepted
H_2	Professional Development (X_1) → Teaching Motivation (Y_2)	3.985	0.000	Accepted
H_3	Learning Technology (X_2) → Professional Competence (Y_1)	3.567	0.001	Accepted
H_4	Learning Technology (X_2) → Teaching Motivation (Y_2)	3.120	0.002	Accepted
H_5	Gender Moderation (Z) → (X_1 * Y_1)	2.560	0.011	Accepted
H_6	Gender Moderation (Z) → (X_1 * Y_2)	1.250	0.212	Rejected

Source: Data processed by SmartPLS 4.0 (2025)

3.4 Discussion

The findings of this study confirm that professional development (X_1) has the most significant impact on teachers' professional competence (T=4.977). This is in line with Kadeni's (2025) view that superior competence is born from a continuous coaching process and high work discipline [3]. The use of technology (X_2) has also been proven to be significant, supporting Indrakusuma's (2024) findings that the integration of digital tools (Smart Apps) effectively improves the quality of the learning process [2].

An interesting finding was observed in the role of gender moderation. Hypothesis H5 was accepted (T=2.560), which means that gender equality strengthens the influence of training on competence. Female teachers who received equal access and support showed higher competence improvement compared to those who received mini-

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mal support. This reinforces Rindrayani's (2024) argument about the importance of non-technical environmental factors in supporting teacher performance [1]. However, for teaching motivation (H6), the moderating role of gender is not significant. This shows that the drive to teach is a universal calling of conscience and does not depend on gender.

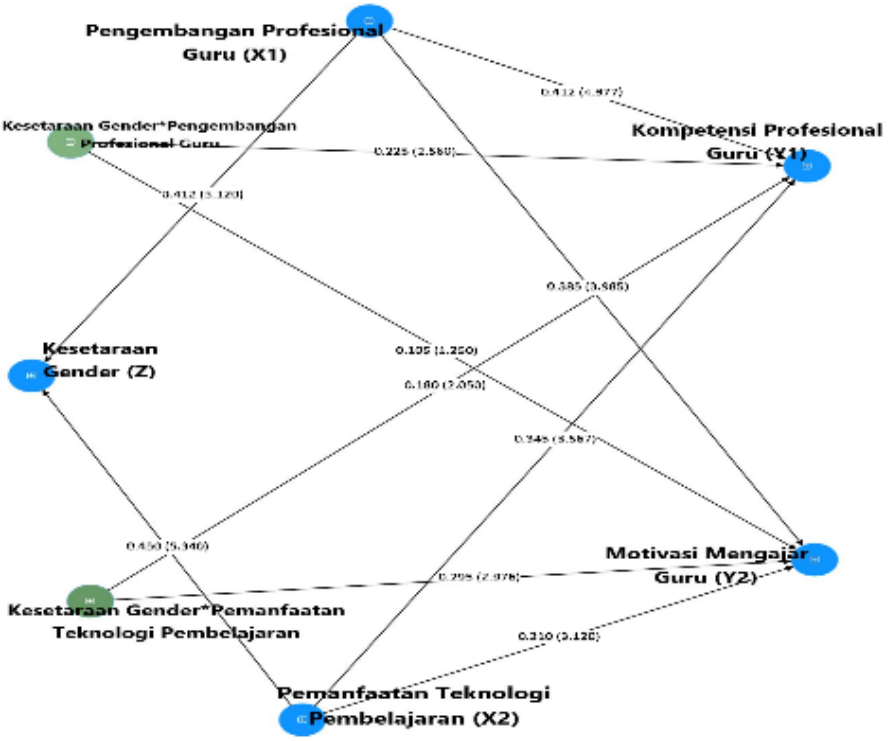


Fig. 1. Structural Model Test Results (Inner Model)

4 Conclusion

a. Teacher professional development and learning technology have a positive and significant effect on teacher competence and motivation.
b. Gender equality has been proven to be an important moderating variable in strengthening the impact of training on professional competence.
c. It is recommended that the Trenggalek District Education Office design inclusive technology training programmes, ensuring that female teachers in mountainous areas have equal access and support to maximise their potential.

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Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Artificial Intelligence (AI) Disclosure

The authors declare that no generative AI or AI-assisted technologies were used in the preparation of this manuscript.

Research Ethics

Ethical review and approval were not required for this study because [brief justification].

Informed Consent Statement

Informed consent was obtained from all participants involved in the study.

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