

Professional and Pedagogical Competence in Relation to Teacher Performance: Evidence from Public Elementary Schools in Indonesia

Halimatussakdiah¹, Herry Sujaini²✉, Warneri³, Ahmad Yani⁴, Masriani⁵, Nor Yazi Khamis⁶, Kevin Zhelan Siregar⁷

¹⁻⁵Faculty of Teacher Training and Education, Universitas Tanjungpura Pontianak, Indonesia

⁶Universiti Malaysia Pahang Al-Sultan Abdullah, Pekan, Pahang, Malaysia

⁷Faculty of Education, The Chinese University of Hong Kong, Hong Kong

DOI: 10.23917/ijolae.v8i3.20431

Received: July 30th, 2026. Revised: September 10th, 2026. Accepted: September 20th, 2026

Available Online: September 25th, 2026. Published Regularly: September, 2026

Abstract

Teacher performance is closely associated with professional and pedagogical competence, particularly teachers' capacity to design meaningful learning, integrate instructional technologies, adapt learning to students' characteristics, and evaluate learning outcomes. This study examined how professional and pedagogical competence contribute to teacher performance and the advancement of learning practices among elementary school teachers in Gugus 1 Simpang Hilir, Kayong Utara, Indonesia. A survey with quantitative correlational research design was utilized where 39 teachers were selected via saturated sampling. A five-point Likert scale questionnaire which followed the competency standards outlined in the Regulation Number 16 of 2007 issued by Minister of National Education of Republic Indonesia was used to collect data. Descriptive statistics, correlation analysis, regression assumption test, and multiple linear regression were used to analyze the data. It is found that professional competence positively and significantly correlated with teacher performance ($B = 0.551$; $\beta = 0.662$; $p < 0.001$), while pedagogical competence positively and significantly correlated ($B = 0.245$; $\beta = 0.310$; $p = 0.041$). Concurrently, the regression equation was significantly ($F = 218.002$; $p < 0.001$) with $R^2 = 0.924$ and Adjusted $R^2 = 0.920$, meaning that professional and pedagogical competence concurrently explained 92.4% of the variation in teacher performance. The high correlation between professional and pedagogical competence ($r = 0.949$) and VIF = 10.120 indicates a severe multicollinearity problem.

Keywords: meaningful learning, pedagogical competence, progressive learning, learning design, professional competence.



This is an open access article under the CC-BY license

✉Corresponding Author:

Herry Sujaini, Faculty of Teacher Training and Education, Universitas Tanjungpura Pontianak, Indonesia

E-mail: hs@fkip.untan.ac.id

1. Introduction

Teachers' competencies can be considered as one of the crucial determinants of the quality of educational processes and teachers' efficiency in carrying out their professional functions. According to the Law of the Republic of Indonesia Number 14 of 2005 concerning Teachers and Lecturers, the

Republic of Indonesia obliges teachers to possess pedagogical, personality, social, and professional competencies as the basic foundation of their professional activity (Republic of Indonesia, 2005, Article 10 paragraph (1)). Among these competencies, professional and pedagogical competencies can be highlighted in particular because they

are associated directly with teachers' ability to master their subjects, to organize learning, and to estimate learning outcomes (Nursalim, 2017). On the one hand, professional competence includes the following qualities: mastery of subject matter, structures, concepts and scientific mentality; continuous professional development. On the other hand, pedagogical competence refers to the ability to understand the characteristics of students; to organize and to estimate learning (Haenilah, 2015). Thus, the integration of professional and pedagogical competence enables teachers to transform disciplinary knowledge into purposeful learning designs, appropriate instructional strategies, and meaningful classroom experiences.

The importance of this issue becomes especially evident under conditions of constant changes in curriculums, fast development of technologies used in education, and new expectations concerning the role of teachers. Today, teachers are no longer positioned merely as transmitters of knowledge but as learning designers and facilitators who create meaningful, adaptive, and technology-supported learning experiences based on students' diverse characteristics and learning needs (Ramadhan & Yuwono, 2025). These demands require teachers to continuously develop their professional knowledge and their capacity to select innovative instructional strategies, integrate appropriate educational technologies, design meaningful learning activities, and evaluate learning processes and outcomes. Thus, teacher competence should be not only formally defined but also regarded as operational and reflected in the quality of teachers' organization, implementation, management, and estimation of learning.

As a matter of fact, teacher performance can be considered as an important aspect of professional competence in educational

practice. The high performance of teachers depends not only on the extent of their mastery of instructional materials but also on their ability to apply this knowledge for creating an effective learning experience (Winursiti et al., 2024). Teachers having high professional competence should have comprehensive mastery of subject matter; develop learning materials creatively; participate in continuous professional development; and use relevant information and communication technologies. At the same time, the pedagogical competence requires teachers to understand characteristics of students; to have mastery of learning theories and principles; to develop and to implement curricula; to select adequate learning strategies; to manage learning process and to conduct appropriate estimations (Khamis, 2019). The combination of these two domains of competence is crucial for understanding reasons of variation in teacher performance. Nevertheless, developing professional and pedagogical competence remains a challenging educational issue, particularly in responding to curriculum changes, technological developments, diverse learner characteristics, and the increasing need for adaptive, student-centered, and meaningful learning experiences (Delafini et al., 2025).

These challenges are particularly evident in elementary education, where teachers need to accommodate diverse learner characteristics while designing developmentally appropriate, inclusive, and engaging learning experiences. Preliminary study involving 39 teachers from Gugus 1 Simpang Hilir Elementary School, Kayong Utara Regency showed that some of these teachers required improvement in professional and pedagogical competencies. In particular, 13 teachers (33.3%) needed to improve their professional competence in mastering subject matter, developing creative

and contextual learning materials, and utilizing learning technologies to support more adaptive and student-centered learning. Regarding pedagogical competence, 16 teachers (41.0%) required improvement in designing student-centered learning, applying appropriate assessment strategies, and adapting instructional materials and activities to diverse learner characteristics and learning needs (Noviany & Yogyakarta, 2019). In addition, the results of principal supervision showed that about 30% of teachers had not demonstrated good performance in organizing, implementing, and estimating learning. These preliminary results can be regarded as an empirical proof of the fact that challenges concerning professional and pedagogical competences exist in the research setting and should be explored systematically in order to establish the relationship between these competencies and teacher performance (Riwukore & Habaora, 2021).

Empirical studies conducted previously have already proved the presence of relationships between teachers' competences and teacher performance. For example, Cahyana et al. (2023) have found that pedagogical and professional competences influence performance of elementary school teachers in Secang District, Magelang Regency. Similar results were obtained by Suyitno (2018) in particular, he stated that there is an influence of pedagogical and professional competences on teachers' performance, but the study was conducted among English teachers at the Madrasah Aliyah level. In addition, Lubis (2025) showed that professional and pedagogical competences influence teacher performance at the junior high school level in Perhentian Raja District. All these studies prove the importance of teacher competence for teachers' performance (Cahyono et al., 2020). However, it can be concluded that different

educational levels, institutional characteristics, regional contexts, and competency conditions indicate that the relationship is not necessarily uniform in educational settings.

Apart from differences in research sites and educational units, another research gap concerns the analysis of professional and pedagogical competences in one explanatory model. Previous empirical studies have revealed the existence of relationships or simultaneous influences between teacher competencies and performance, but the contribution of each competence has not always become the focus of these studies (Şentürk & Zeybek, 2019). It is important because professional and pedagogical competence represents different domains of teachers' competence. Professional competence is concerned with the mastery of scientific and instructional substance and continuous professional development, whereas pedagogical competence is concerned with the ability to transform this knowledge in learning that takes into account characteristics and learning needs of students (König et al., 2021). Thus, the analysis of these two competences gives the opportunity to identify the statistical significance of each of these competences and the extent to which their combined contribution explains the variations in teacher performance.

In order to eliminate this gap, this study operationalizes professional and pedagogical competences according to the competency standards for teachers stipulated in the Minister of National Education Regulation Number 16 of 2007. Professional competence is estimated using the dimensions that include: mastery of material, structure, concepts and scientific mentality; mastery of competency standards; creative development of learning materials; continuous professional development; and utilization of information

and communication technology (Masrun & Damrah, 2022). Pedagogical competence is estimated using the following dimensions: understanding student characteristics; mastery of learning theories and principles; curriculum development; learning design and implementation; utilization of learning technology; and estimation of learning outcomes. Teacher performance is estimated as a dependent variable indicating the extent to which teachers implement their professional duties in the process of learning (Mamayoqubova & Begmatova, 2023). The use of these dimensions enables the study to go beyond the analysis of the presence of relationships between teacher competences and performance and to explore the contribution of each competency in an integrated model.

The novelty of this study consists in the analysis of the partial and simultaneous influences of professional and pedagogical competences on teacher performance among 39 teachers from five public elementary schools in school cluster in Simpang Hilir District, Kayong Utara Regency. The situation of school cluster is particularly important for this research because it involves multiple public elementary schools operating in the same educational region but showing different characteristics of teachers and learning process. Thus, the contribution of this study is not grounded only on the geographical specificity. It lies in the analysis of the contribution of professional and pedagogical competences in one regression model and in identification of the contribution of each of these competences to teacher performance (Siri et al., 2020). This approach gives more specific empirical information concerning the contribution of each competency domain to teacher performance when two competencies are considered simultaneously.

Thus, based on the described empirical conditions and research gaps, this study aims to analyze: (1) the influence of professional competence on teacher performance; (2) the influence of pedagogical competence on teacher performance; and (3) the simultaneous influence of professional competence and pedagogical competence on teacher performance among teachers at Gugus 1 Simpang Hilir Elementary School, Kayong Utara Regency.

2. Method

In this study, the quantitative research method with correlational survey design was used. The choice of the quantitative approach is explained by the measurement of professional competence, pedagogical competence and teacher performance in terms of numerical scores and further the analysis of the relations between these variables via statistical methods (Umar & Mardesia, 2023). The correlational survey design was appropriate for the current research because it aimed at exploring the relation between the levels of professional competence and pedagogical competence and teacher performance separately and jointly without any manipulation with the research variables.

The research was conducted in five public elementary schools of Gugus 1 Simpang Hilir, Kayong Utara Regency, Indonesia. The unit of analysis was individual teacher. Professional competence (X1) and pedagogical competence (X2) were defined as independent variables and teacher performance (Y) – as the dependent variable. Data were collected via structured questionnaire using Google Forms. It provided standardization of the data collection process at the level of the participating schools as well as ensured that the questionnaire was presented equally for all the respondents.

a. Population and Sampling

The population included all 39 teachers who worked in the five public elementary schools of Gugus 1 Simpang Hilir, Kayong Utara Regency. The saturated sampling was used in the current study due to the relatively small population size and accessibility of its all members (Sugiyono, 2018). In accordance with the saturated sampling technique all population members become research respondents. Thus, the sample of 39 teachers was obtained.

The application of saturated sampling method aimed at maximization of population coverage and minimization of the possibility of sampling omission in the given research context. The obtained results represent the empirical situation of the participating teacher population of Gugus 1 Simpang Hilir. The fact that the research was conducted with the participation of all accessible population members and not with the help of the probability sample selected from larger population should be taken into account in the interpretation of the findings.

b. Variables and Operationalization

In this research two independent variables and one dependent variable were explored. The independent variables were professional competence (X1) and pedagogical competence (X2) and the dependent variable – teacher performance (Y). The operationalization of the variables was based on the standards of competencies formulated in the Minister of National Education Regulation Number 16 of 2007 regarding Academic Qualification Standards and Teacher Competencies.

The professional competence was operationalized through five dimensions: (1) mastery of materials, structures, concepts, and scientific thought patterns; (2) mastery of competency standards; (3) creative and contextual development of instructional materials; (4) continuing professional development; (5) utilization of information and communication technology. These dimensions reflect the ability of the teacher to show the substantive mastery in his/her field, to develop instructional content, continue professional development and use technology in professional activities.

The pedagogical competence was operationalized through seven dimensions: (1) understanding student characteristics; (2) mastery of learning theories and learning principles; (3) curriculum development; (4) learning design; (5) implementation of learning; (6) utilization of learning technology; (7) assessment and evaluation of learning. These dimensions reflect teachers' capacity to translate professional knowledge into learner-centered learning designs and instructional practices that respond to students' characteristics, needs, and learning contexts.

The teacher performance was operationalized through three core dimensions of teacher's learning-related duties: (1) learning planning; (2) implementation of learning; (3) learning evaluation. These indicators reflect the way in which the teachers perform their primary learning-related responsibilities.

The operationalization of the research variables is presented in the Table 1.

Table 1. Research Instrument Grid

Variables	Indicator	Source
Professional Competence (X1)	Mastery of material, structure, concepts, and scientific thought patterns	Minister of National Education Regulation No. 16 of 2007
	Mastery of competency standards	Minister of National Education Regulation No. 16 of 2007
	Creative and contextual development of materials	Minister of National Education Regulation No. 16 of 2007
	Continuing professional development	Minister of National Education Regulation No. 16 of 2007
	Utilization of information and communication technology	Minister of National Education Regulation No. 16 of 2007
Pedagogical Competence (X2)	Understanding student characteristics	Minister of National Education Regulation No. 16 of 2007
	Mastery of learning theories and learning principles	Minister of National Education Regulation No. 16 of 2007
	Curriculum development	Minister of National Education Regulation No. 16 of 2007
	Learning design	Minister of National Education Regulation No. 16 of 2007
	Implementation of learning	Minister of National Education Regulation No. 16 of 2007
	Utilization of learning technology	Minister of National Education Regulation No. 16 of 2007
	Assessment and evaluation of learning	Minister of National Education Regulation No. 16 of 2007
Teacher Performance (Y)	Learning planning	Indicators of implementation of teachers' main tasks and previous research
	Implementation of learning	Indicators of implementation of teachers' main tasks and previous research
	Learning evaluation	Indicators of implementation of teachers' main tasks and previous research

c. Research Instrument and Measurement

The research was conducted using a structured questionnaire in which the participants rated each item in accordance with a five-point Likert scale. The scale ranged from 1 to 5; namely, 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. Respondents had to choose an option which was consistent with their own conditions, competences and realization of teaching responsibility.

Questionnaire items to measure professional and pedagogical competence

were formulated in accordance with competency dimensions defined in Minister of National Education Regulation Number 16 of 2007. Questionnaire items to assess teacher performance were formulated with respect to the implementation of teachers' main instructional responsibilities, especially learning planning, learning implementation, and learning evaluation on the basis of previous research findings.

It is worth mentioning that each of the measures was built in such a way that each construct would be measured using the relevant set of indicators. Professional

competence mainly concerned teachers' knowledge and professional development, while pedagogical competence related to teachers' ability to develop and implement effective learning according to students' features (Rusilowati & Wahyudi, 2020). Teacher performance entailed practical implementation of teachers' instructional responsibility.

d. Instrument Validity and Reliability

Instrument validity was tested using empirical item validity via calculation of the Pearson product-moment correlation coefficient. The analysis entailed the examination of the correlation between the score of each questionnaire item and the score of the corresponding construct. When the correlation coefficient for each item reached the critical value at 5% significance level (considering the sample size), the item was regarded as meeting the validity criterion. The corrected item-total correlation was also calculated as the additional validation method.

Instrument reliability was tested via calculating Cronbach's alpha coefficient for each research variable. It served as an indicator of the internal consistency of the items measuring the same construct. When the coefficient of $\alpha \geq 0.70$, it indicated acceptable internal consistency. The validity and reliability tests were conducted prior to hypothesis testing in order to check if the instrument provided sufficient consistency for further analysis.

e. Data Analysis

The data analysis was carried out using IBM SPSS and encompassed three major steps: descriptive analysis, regression assumption testing and hypothesis testing.

Firstly, descriptive statistics were used to describe the distribution of professional

competence, pedagogical competence and teacher performance. The minimum, maximum, mean and standard deviation values were obtained for each variable in order to present the picture of observed levels and variability of the measures under investigation among the participating teachers.

Secondly, regression assumptions were checked prior to carrying out any inference. The assumptions involved normality, linearity, multicollinearity and homoscedasticity. Residual normality was checked using the Shapiro–Wilk test at 5% significance level. The linear association was tested in order to verify whether the relationship between each independent variable and teacher performance was linear. Multicollinearity was checked using Tolerance and Variance Inflation Factor (VIF) to find out if there was an excessive inter-correlation among the independent variables. Heteroscedasticity was tested using appropriate statistical test and residuals checking. The above-mentioned procedures were performed to make sure that the data satisfied the regression assumptions.

Thirdly, the inference was performed using simple and multiple linear regression. Simple linear regression was used in order to check the contribution of professional competence to teacher performance separately and the contribution of pedagogical competence to teacher performance separately. Then multiple linear regression was used to test the contribution of professional and pedagogical competence to teacher performance taken together. The model of multiple regression is as follows:

$$Y = a + b_1X_1 + b_2X_2 + e$$

Where Y is teacher performance, a is regression constant, b1 is regression

coefficient of professional competence, b_2 is regression coefficient of pedagogical competence, X_1 is professional competence, X_2 is pedagogical competence, and e is error term.

f. Hypothesis Testing and Contribution Analysis

The statistical significance of each of the regression coefficients was analyzed with the use of t-test, while the statistical significance of the multiple regression model as a whole was estimated by means of F-test. All statistical decisions were made by means of using the significance level $\alpha = 0.05$. The statistically significant coefficient meant that the corresponding independent variable had a significant relationship with teacher performance in the defined regression model.

In order to analyze the relative contribution of the independent variables, the standardized regression coefficient (β) was used. The standardized coefficients enable examining the relative strength of the relationships of professional competence and pedagogical competence with teacher performance in the framework of the multiple regression model. The coefficient of determination (R^2) and adjusted R^2 were analyzed in order to find out what proportion of teacher performance variation can be explained by the independent variables of the regression model.

Thus, the proposed analytical framework allowed addressing three interrelated questions. They concerned whether professional competence is significantly related with teacher performance, whether pedagogical competence is significantly related with teacher performance, and whether these two competency areas explain a significant share of teacher performance variation jointly.

3. Results and Discussion

The study was carried out to investigate the relationships between professional competence, pedagogical competence, and teacher performance among teachers of Gugus 1 Simpang Hilir, Kayong Utara Regency. The analysis was done sequentially in order to provide a thorough interpretation of the empirical findings. Firstly, descriptive statistics, correlation analysis and regression assumption testing were performed to describe the nature of the research variables and check their suitability for regression analysis. Secondly, partial regression analysis was carried out to investigate the individual impact of professional competence and pedagogical competence on teacher performance. Thirdly, multiple regression analysis was performed to investigate the simultaneous impact of both competency variables and identify the strength of the regression equation. The high correlation between the two independent variables and, as a result, multicollinearity received special attention in the analysis, since such conditions affect the correct interpretation of the partial regression coefficients.

The results and discussion are presented in the following three sections: (1) descriptive statistics, correlation and regression assumption testing; (2) partial contributions of professional and pedagogical competence to teacher performance; and (3) simultaneous contribution, explanatory power and implications of the regression model.

a. Descriptive Statistics, Correlation and Regression Assumption Testing

The first step of the analysis was aimed at identification of the empirical characteristics of the research variables and assessment of the appropriateness of the data for further regression analysis. This step is particularly important because the regression coefficients

and the results of inferential tests can be properly interpreted only after checking the data structure and model assumptions. The analysis involved descriptive statistics, bivariate correlation analysis and regression diagnostics. Special attention was paid to the relationship between professional competence (X1), pedagogical competence (X2) and teacher performance (Y) and the

possibility of overlapping of the two independent variables.

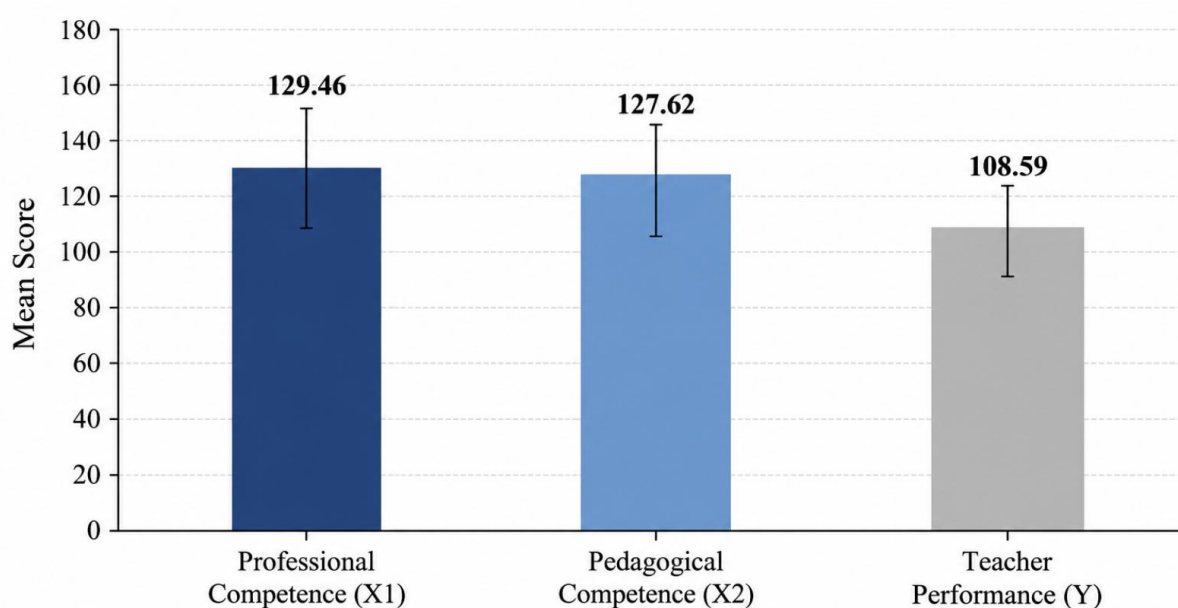
The descriptive analysis revealed that the mean score of professional competence was 129.46 (SD = 21.34), while pedagogical competence had the mean score of 127.62 (SD = 22.50). Teacher performance had the mean score of 108.59 (SD = 17.78).

Table 2. Descriptive Statistics of Research Variables

Variables	N	Mean	Standard Deviation	Research Role
Professional Competence (X1)	39	129.46	21.34	Independent variable
Pedagogical Competence (X2)	39	127.62	22.50	Independent variable
Teacher Performance (Y)	39	108.59	17.78	Dependent variable

As can be seen from Table 2, the difference between the average ratings of professional and pedagogical competencies is rather small – 1.84. This descriptive pattern may be considered as proof that both of these competency areas have been evaluated on almost equal levels by the respondents (Setiawan et al., 2025). Nevertheless, the standard deviations point out some variations between individual assessments. Specifically,

there was a little bit more variation in the assessment of pedagogical competency (SD = 22.50) than in professional competency (SD = 21.34); the standard deviation in teacher performance was lower (SD = 17.78). It means that there was some difference in the profiles of teacher competency and performance. Such variation is essential for regression analysis as relationships are built upon variation.



Note: Error bars represent ± 1 standard deviation (SD).

Figure 1. Mean Scores of Professional Competence, Pedagogical Competence, and Teacher Performance

Figure 1 demonstrates the graphical representation of the mean scores by all the three variables under study. Figure 1 suggests that the mean scores of professional competence and pedagogical competence are rather equal, but teacher performance demonstrates lower mean value numerically. Nevertheless, it would be erroneous to claim that one construct is better in substance than another since the number of questionnaire questions and the scale range of variables can differ from each other. In general, it should be recognized that the described descriptive statistics are used to create the empirical scales of variables before the examination of

their relationships through the inferential analysis (Meiyanti et al., 2022).

The second step in this case included the examination of bivariate relationships. As a result of the correlation analysis, the very high positive correlations were revealed between all three variables. Thus, the professional competence was positively correlated with teacher performance at $r = 0.956$; the pedagogical competence was also correlated with teacher performance at $r = 0.938$. In addition, the correlation between professional and pedagogical competencies was rather high at $r = 0.949$.

Table 3. Correlation Matrix of Research Variables

Variables	Professional Competence (X1)	Pedagogical Competence (X2)	Teacher Performance (Y)	Interpretation
Professional Competence (X1)	1.000	0.949	0.956	Very strong positive association with Y
Pedagogical Competence (X2)	0.949	1.000	0.938	Very strong positive association with Y
Teacher Performance (Y)	0.956	0.938	1.000	Strongly associated with both predictors

Table 3 shows the correlation matrix, which presents two major empirical findings. First, professional competence as well as pedagogical competence have a very strong positive correlation with teacher performance. For example, a coefficient of 0.956 obtained for the X1-Y relationship indicates that a high score on professional competence is likely to coincide with a high score on teacher

performance in the sample under investigation. In turn, a coefficient of 0.938 obtained for the X2-Y relationship indicates that pedagogical competence and teacher performance are strongly correlated with each other. Second, a coefficient of correlation of 0.949 obtained for the X1-X2 relationship indicates an exceptionally high correlation between these two competencies.

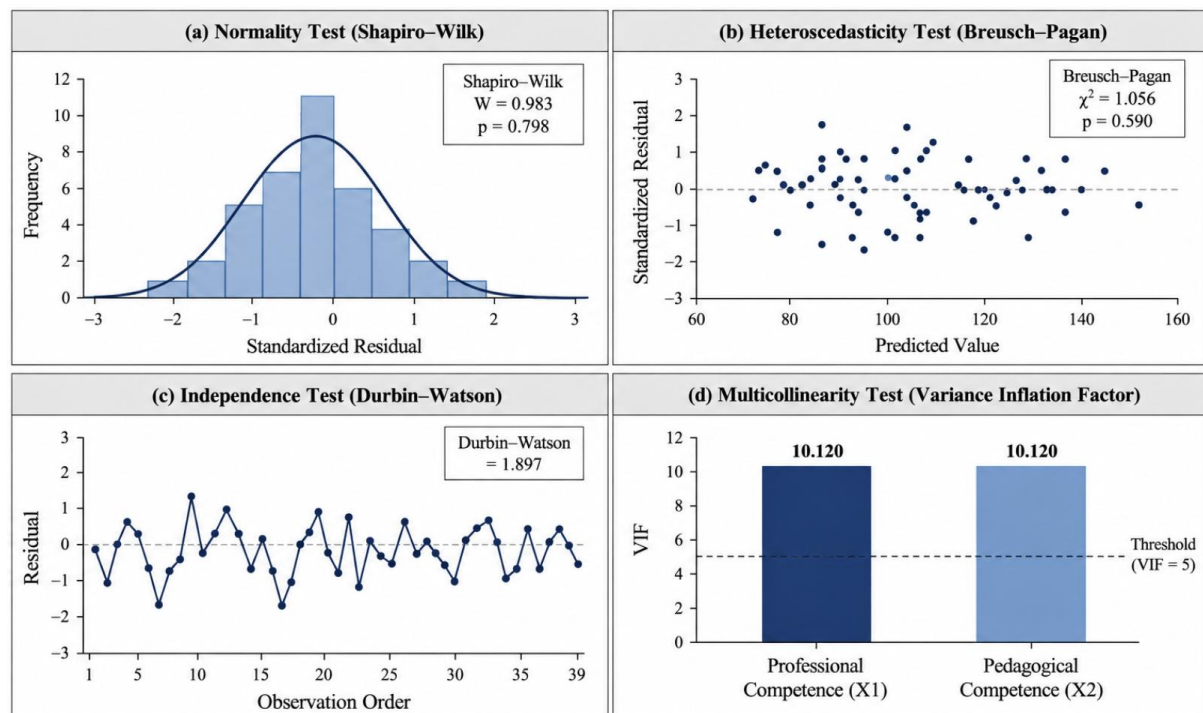


Figure 2. Regression Model Assumption Diagnostics

The results of diagnostics in figure 2 provide additional insight into the statistical properties of the regression model. According to the Shapiro–Wilk test, $W = 0.983$ ($p = 0.798$), which shows that there is not enough statistical ground to reject the null hypothesis of the normally distributed residuals. In regression analysis, checking the normality of the distribution needs to be done for the residuals, and not just the raw scores of the independent variables (Anwar, 2025). Moreover, the recent methodological literature suggests that residual diagnostics are the basis for the assessment of the normality in regression models.

Thus, the result is supportive of further regression analysis. As $p > 0.05$, the residual distribution does not show statistically significant deviation from normality. It should be noted that this result cannot be interpreted as evidence of perfectly normally distributed residuals. On the contrary, it suggests that the current sample does not provide enough grounds for statistically significant violation of the assumption of

normally distributed residuals (Pamuji & Limei, 2023). Such result is especially relevant due to the small number of respondents (39 people) where the visualization of residual distributions can supplement the Shapiro–Wilk test.

The second diagnostic is related to the homoscedasticity of the residuals. According to the Breusch–Pagan test, the statistic was 1.056 ($p = 0.590$). Due to the fact that the p -value exceeds the significance level of 0.05, there is no statistical evidence of heteroscedasticity of the regression residuals. The main idea of the procedure is to check whether the regression errors are non-constantly varying depending on predictors. Initially, the test was developed as the formal testing procedure of the presence of heteroscedastic disturbances in the linear regression (Ansori et al., 2021). Therefore, the current non-significant result is supportive of the assumption of constancy of the residual variance.

This result is important due to the fact that the heteroscedasticity can influence the

reliability of the standard errors and consequently inference about the regression coefficients. The methodological literature on the Breusch-Pagan test also notes that the key point here is whether the non-constant variance of errors violates the usual uncertainty of estimates in ordinary least-squares regression. In the present case, however, the p-value of 0.590 does not indicate any problem of this kind.

The value of the Durbin-Watson statistic was 1.897, which is close to the conventional reference value of 2. Based on this result, the current data cannot indicate any serious residual autocorrelation problem. The statistic is widely used to check the serial dependence of the regression residuals, and values around 2 correspond to weak or negligible first-order autocorrelation (Liakopoulou, 2011). Formally, the statistic relies on the relationship between consecutive residuals and their autocorrelation. Therefore, the value of 1.897 of the statistic in the present study does not indicate any problem of residual dependence.

However, since the present study deals with cross-sectional data from 39 teachers and not longitudinal or time series observations, the result on the Durbin-Watson statistic should not be overinterpreted. The independence of the observations is more basically justified by the design of the research and sampling procedure than by the statistic itself. Therefore, the reported value of 1.897 can be considered as an additional diagnostic indicator, but not the only justification of the independence among the respondents.

The most important diagnostic problem relates to the multicollinearity between professional and pedagogical competence. The correlation between X1 and X2 was 0.949, while the VIF for both predictors was 10.120. These numbers indicate an extremely

high overlap between the two independent variables. The statistic is designed to measure how much the variance of the regression coefficient is increasing due to the linear dependence of this variable on other predictors (Batool et al., 2018). The value of 5-10 is commonly used as a warning threshold in methodological research, although there is no universal cut-off value and the VIF should be interpreted in relation to the context of the research and other diagnostics.

Therefore, the reported VIF of 10.120 is sufficiently high to call for special attention at the interpretation of the unique regression coefficients of professional and pedagogical competence. Multicollinearity does not necessarily invalidates the overall regression model and does not mean that the predictors do not have any relationship with teacher performance. Instead, the problem makes interpretation of the unique effect of each predictor more complicated after controlling for the other predictor (Afalla & Fabelico, 2020). High collinearity inflates coefficient variance and standard errors and makes individual regression coefficients more sensitive to the model specification.

It is important that the high X1-X2 correlation is also substantively relevant for the case of teacher competences. Professional competence refers to the knowledge of the subject matter and professional knowledge, whereas the pedagogical competence refers to the ability to use this knowledge for organizing an effective process of learning. These domains are conceptually different but connected in practice (Sudarwanto & Sulistyowati, 2019). Teacher, who is competent in the knowledge of instructional content, can also be able to organize meaningful learning activities, while successful pedagogical practices require appropriate mastery of the subject matter.

However, the high correlation means that the further multiple regression coefficients should not be interpreted as evidence of independence of these competencies. In particular, high bivariate correlations with teacher performance should not be considered as direct evidence of the unique effects obtained through the multiple regression model. Multicollinearity makes individual coefficient estimates less stable even if the regression model is able to explain the substantial part of variation, and, therefore, the partial coefficients need to be interpreted together with the statistics of correlation and VIF (Fauziyah et al., 2022).

Overall, the diagnostics provide a mixture of results on the assumptions of the regression model. The normality of residuals, the homoscedasticity and the Durbin-Watson result do not indicate any significant violations of the respective assumptions. The Shapiro-Wilk test ($W = 0.983$; $p = 0.798$) supports the normality of residuals, while the Breusch-Pagan test (1.056 ; $p = 0.590$) does not prove heteroscedasticity. The value of the Durbin-Watson of 1.897 does not suggest any substantial residual autocorrelation. At the same time, the VIF of 10.120 for both predictors together with the X_1 - X_2 correlation of 0.949 identifies multicollinearity as the problem of interpretation of the subsequent partial regression coefficients. Consequently, the regression results discussed below should be interpreted not only from the standpoint of statistical significance but also in view of the

substantial empirical connection between professional and pedagogical competence (Afandi et al., 2023).

b. Partial Contributions of Professional and Pedagogical Competence to Teacher Performance

After conducting the diagnostic tests of descriptive, correlational, and regression analysis, the next step was to look at the partial contribution of professional competence and pedagogical competence on the performance of teachers. This test was done using multiple linear regression where professional competence (X_1) and pedagogical competence (X_2) were included simultaneously as predictors of teacher performance (Y). Partial testing is crucial since the correlations provided above do not differentiate between the association of the two competency areas and the individual contributions of each predictor while holding the other predictor constant (Toom, 2017). Therefore, regression coefficients give more information about the association between the two competencies and teacher performance.

The regression equation was:

$$Y = 5.958 + 0.551X_1 + 0.245X_2$$

where Y is teacher performance, X_1 is professional competence, and X_2 is pedagogical competence. Positive coefficients suggest that both competence measures have positive associations with the dependent variable.

Table 4. Multiple Regression Coefficients for Professional and Pedagogical Competence

Predictor	B	Standardized β	t	Sig. (p)
Constant	5.958	—	—	—
Professional Competence (X_1)	0.551	0.662	4.520	< 0.001
Pedagogical Competence (X_2)	0.245	0.310	2.118	0.041

Table 4 demonstrates that professional competence has an unstandardized regression coefficient of $B = 0.551$, a standardized coefficient of $\beta = 0.662$, $t = 4.520$, and $p < 0.001$. Therefore, having taken into account pedagogical competence in the model, professional competence still possesses a positive and statistically significant partial relationship with the performance of teachers. In terms of statistics, one unit of professional competence is accompanied by an increase in the value of teacher performance by 0.551 units (Taniredja & Abduh, 2016). The statistical significance of the coefficient means that the mentioned relation is highly unlikely to occur due to sample variability in the specified context.

The coefficient value and its sign can be explained from the point of view of the role of professional competence in teachers' instructional tasks. Professional competence includes competence in subject matter, structure, concepts, scientific thinking, development of instructional materials, professional development, and the use of information and communication technology (Zulkipli et al., 2022). In turn, these competencies provide teachers with the knowledge required to develop contextual learning materials, select relevant examples, integrate appropriate technologies, and design instructional activities aligned with learning goals and students' needs (Hakim, 2015).

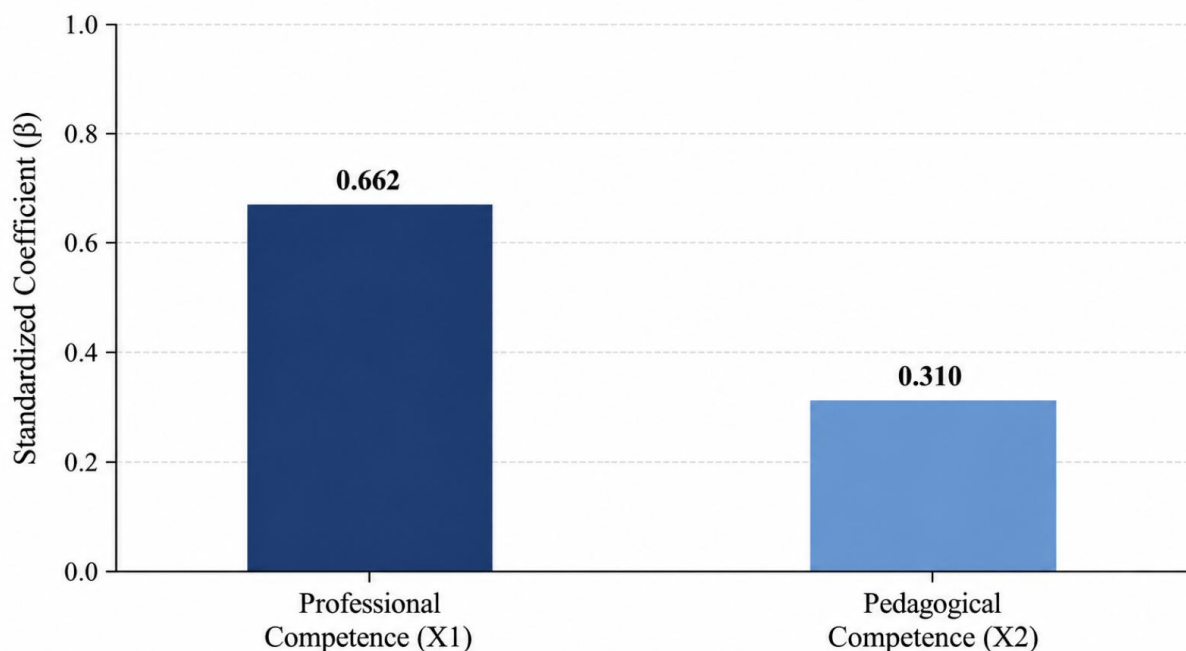


Figure 3. Standardized Regression Coefficients of Professional and Pedagogical Competence

Figure 3 illustrates the standardized regression coefficients for the two predictors in the multiple regression equation. The standardized coefficient for professional competence is equal to $\beta = 0.662$, and the standardized coefficient for pedagogical competence equals $\beta = 0.310$. Standardized coefficients being shown on the same scale

provides the opportunity to evaluate the differences in the magnitude of the statistical association of the predictors with teacher performance within the same model. Thus, Figure 3 supplements Table 3 where the unstandardized regression coefficients are presented.

However, the difference in the standardized coefficients cannot be interpreted straightforwardly. The larger coefficient of professional competence cannot be taken as the proof of the greater substantive significance of the variable in the context of teacher performance. As follows from the analysis conducted above, professional and pedagogical competencies are correlated very strongly ($r = 0.949$). Moreover, both of the predictors have VIF values of approximately 10.120. In other words, the standardized coefficients reflect relationships estimated when there is a substantial overlap between the predictors (Khamis, 2019). Hence, the right interpretation is that professional competence has a larger standardized coefficient within the regression model, however, its unique contribution is affected by multicollinearity.

The finding for pedagogical competence provides complementary evidence. Pedagogical competence resulted in the following statistics: the unstandardized coefficient of $B = 0.245$, standardized coefficient of $\beta = 0.310$, t -statistic of 2.118,

and probability of 0.041. The obtained p -value is less than 0.05 that corresponds to the level of statistical significance. It means that pedagogical competence has a statistically significant positive partial association with teacher performance conditional on the inclusion of professional competence into the regression equation (Riwukore & Habaora, 2021).

From the conceptual point of view, it is logical due to the nature of pedagogical competence. Teachers need not only to understand what should be taught but also to determine how disciplinary knowledge can be transformed into meaningful, student-centered, and contextually relevant learning experiences. Pedagogical competence involves knowledge of the characteristics of the student, learning theories and principles, development of a curriculum, learning design and implementation, application of learning technologies, and evaluation of the outcomes of learning (Şentürk & Zeybek, 2019). All of the skills are relevant to teaching operations directly.

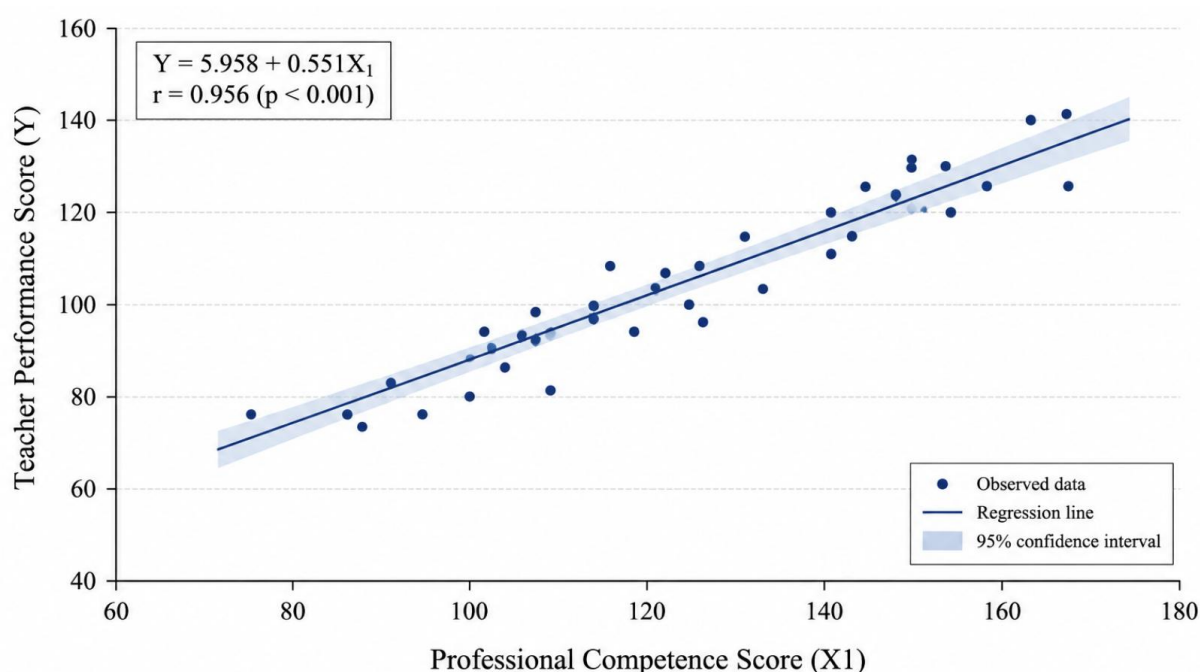


Figure 4. Relationship between Professional Competence and Teacher Performance

Figure 4 is supposed to graphically illustrate the relationship between professional competence and teacher performance using a scatter plot and a regression line. However, the figure must be based on individual teachers' scores rather than calculated based on the correlation coefficient reported in the paper. Indeed, the reported bivariate correlation of $r = 0.956$ shows an extremely strong relationship between professional competence and teacher performance. That is why the empirical relationship illustrated in Figure 4 is expected to reflect the fact that teachers who score high in professional competence usually also score high in teacher performance. However, it is necessary to note that the figure illustrates the relationship, but does not prove any causal effect.

The extremely strong correlation between professional competence and teacher performance can be explained using the professional knowledge perspective. Indeed, [König et al. \(2021\)](#) argue that teachers' knowledge base is important for transforming subject matter into teachable content. In the

case of the current study, the perspective can explain the strong relationship between professional competence and teacher performance since professional knowledge enables teachers to organize instructional content, create explanations, learning materials, and answers students' questions ([Masrun & Damrah, 2022](#)). This process is directly linked to the quality of learning planning and implementation.

This result is consistent with the Human Capital Theory developed by Becker (1993) where knowledge and skills are considered human capital that can help increase individual productivity. In the field of education, professional competence is a form of human capital that can be used when implementing instructional responsibilities. The same idea is reflected in [Schleicher \(2018\)](#)'s opinion regarding the importance of teachers' knowledge and professional capacity in providing quality education. Thus, the positive coefficient of professional competence empirically proves the relevance of professional knowledge to teachers' work performance.

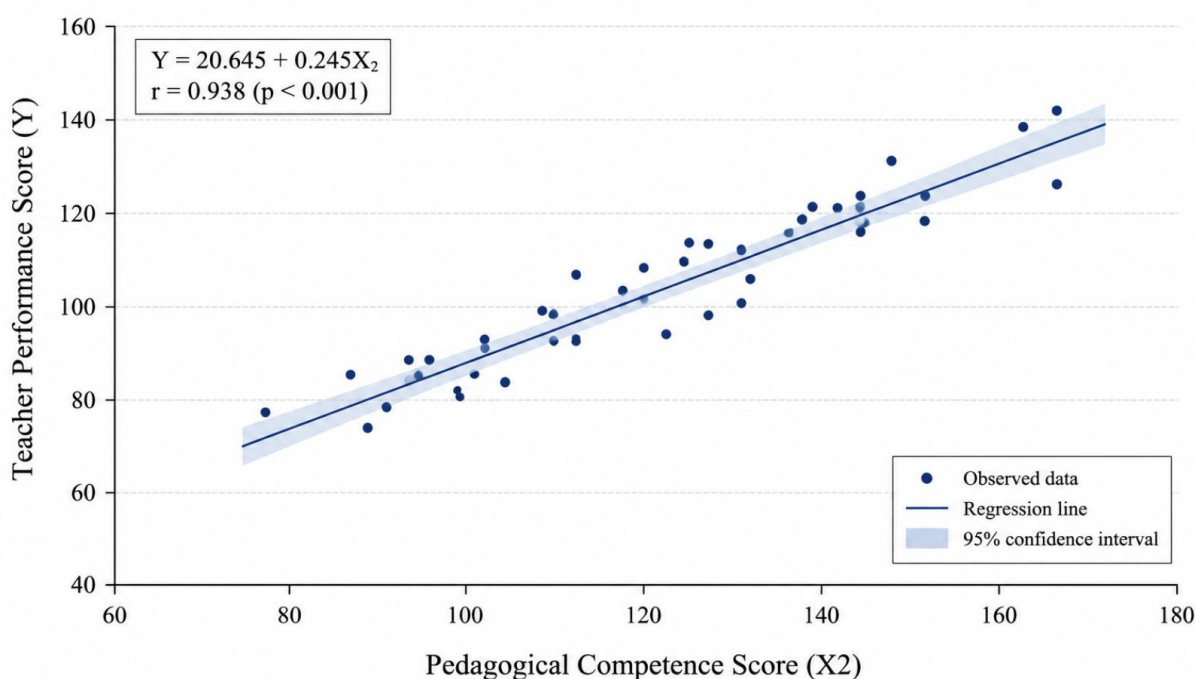


Figure 5. Relationship between Pedagogical Competence and Teacher Performance

Figure 5 illustrates the associated bivariate relationship between pedagogical competence and teacher performance. The correlation coefficient of $r = 0.938$ indicates an extremely strong relationship between the two variables. The expected positive pattern in the scatterplot is in line with the statistical correlation, as higher scores of pedagogical competence tend to appear together with higher scores of teacher performance in the analyzed sample (Mamayoqubova & Begmatova, 2023). However, similarly to Figure 4, this visual illustration should be regarded as an association rather than a cause-and-effect relationship because the chosen research design is a correlational survey.

The relationship between pedagogical competence and teacher performance can be explained by practical requirements of classroom work. Pedagogical competence allows identifying characteristics of learners, selecting adequate instructional approaches, organizing activities, developing learning experiences, and evaluating learning outcomes (Siri et al., 2020). Those actions

correspond well to the used indicators of teacher performance, namely learning planning, implementation, and evaluation (Maghfiroh et al., 2024). Therefore, the positive coefficient is theoretically justified since the predictor and the outcome variables are related to professional activities of teachers.

The finding is also consistent with a broader definition of teacher quality presented by Darling-Hammond et al. (2004) as an indication of the importance of characteristics and professional skills of teachers for the educational process and its outcomes. Moreover, Hakim (2015) found a positive relationship between teacher competence and certain aspects of teacher performance. The contemporary empirical evidence presented by Großmann et al. (2025) also supports the importance of teacher competence for teaching quality and professional performance.

It is critical to make an analytical distinction between bivariate correlations and the partial regression coefficients. The

correlations between professional competence and teacher performance ($r = 0.956$) and pedagogical competence and teacher performance ($r = 0.938$) are considerably larger than usually derived based on the individual regression coefficients. One of the reasons is the very high correlation between both predictors. When X_1 and X_2 are entered simultaneously, the regression coefficients represent the relationship between each predictor and Y , controlling for the other predictor. Therefore, the partial coefficients should not be regarded as simply reflecting the strength of the respective bivariate correlations.

The high correlation between the two competency domains is crucial for interpreting the results. Professional competence and pedagogical competence can be regarded as conceptually distinguishable, but empirically highly correlated constructs in the analyzed sample. The correlation of 0.949 means that teachers who demonstrated higher levels of professional competence were more likely to demonstrate higher levels of pedagogical competence as well. That might be an indicator of the practical interrelation of the substantive knowledge and its application (Umar & Mardesia, 2023). Teaching requires having adequate knowledge of the subject matter and knowing how to teach it.

However, at the same time, multicollinearity diagnosis shows that this interconnection has statistical consequences. The value of 10.120 VIF for both predictors means that the estimated partial coefficients should be interpreted cautiously. In particular, the statistical significance of the coefficients should not be used as an indication that those competencies function independently or one of them has much stronger practical importance than another (Rusilowati & Wahyudi, 2020). Instead, it means that both competency domains demonstrate

statistically significant positive association with teacher performance even when modeled simultaneously despite their empirical interconnection.

This result also has conceptual consequences. According to the findings, professional and pedagogical competence should not be considered as independent components of teacher competence. Professional knowledge might serve as the basis for teaching, while pedagogical knowledge serves as a means to translate it into learning activities (Setiawan et al., 2025). The very high correlation between X_1 and X_2 might be an indication that professional development programs aimed at only one competency domain could ignore the interrelation between those competencies among teachers.

For educational development, the findings highlight the importance of an integrated approach to teacher competence that supports adaptive, student-centered, technology-enhanced, and continuously improving learning practices. Professional development should integrate subject-matter knowledge with learning design, innovative instructional approaches, educational technology utilization, assessment literacy, and systematic reflection on teaching practices (Harmadi et al., 2025; Meiyanti et al., 2022). It is especially relevant in case of elementary education when teachers should combine their subject-matter knowledge with the characteristics and needs of children.

In general, the partial regression analysis proves that both professional and pedagogical competences demonstrate statistically significant positive relationships with teacher performance in the analyzed sample. Professional competence demonstrates $B = 0.551$, $\beta = 0.662$, $t = 4.520$, $p < 0.001$, while pedagogical competence demonstrates $B = 0.245$, $\beta = 0.310$, $t = 2.118$, $p = 0.041$. The

findings expand the bivariate evidence proving that both competency domains demonstrate statistically significant coefficients when analyzed simultaneously. However, the very high correlation between the predictors ($r = 0.949$) and their VIF (10.120) require cautious interpretation of their separate impact.

c. Simultaneous Contribution, Explanatory Power, and Model Implications

Having examined the partial associations among professional competence, pedagogical competence, and teacher performance, the last step of the analysis was aimed at evaluating how much the two competencies taken together account for variations in teacher performance. For this purpose, multiple linear regression analysis was conducted, where both professional competence (X_1) and pedagogical competence (X_2) were included as predictors while teacher performance (Y) was the criterion variable. The reason why multiple regression analysis is required in this case is that teacher performance is a

multidimensional phenomenon that may be linked to a number of related dimensions of teacher capability (Anwar, 2025). Thus, analysis of the predictors taken altogether presents a more complete picture of the relationship than separate analysis of each predictor.

The estimated multiple regression model can be represented as follows:

$$Y = 5.958 + 0.551X_1 + 0.245X_2$$

As can be seen from the positive regression coefficients, both professional competence and pedagogical competence positively associate with teacher performance within the estimated model (Pamuji & Limei, 2023). As for the model itself, it was statistically significant ($F = 218.002$; $p < 0.001$), which means that the set of independent variables is a statistically significant explanation of teacher performance.

This can also be shown by the coefficient of determination. According to the model, $R^2 = 0.924$ and Adjusted $R^2 = 0.920$.

Table 5. Multiple Regression Model Summary

Model	R^2	Adjusted R^2	Explained Variance	Unexplained Variance
Professional Competence + Pedagogical Competence	0.924	0.920	92.4%	7.6%

According to Table 5, professional competence and pedagogical competence explain 92.4% of variance in teacher performance in the research sample. The Adjusted R^2 of 0.920 means that about 92.0% of the variance remains explained after adjustments for the number of independent variables and sample size. The small difference between R^2 and Adjusted R^2 (0.004) means that explanatory power of the regression model is quite high even taking

into account the complexity of the model. However, these figures characterize the explanatory power of the model in the sample and cannot be considered as proof of the causal relationship between professional/pedagogical competence and teacher performance at the level of 92.4%.

The large value of R^2 needs to be explained. High value of the coefficient of determination means that the two predictors explain a considerable amount of variance in

the teacher performance measure (Sudargini & Purwanto, 2020). This fact is coherent with the design of the study because teacher performance is defined by teachers' abilities to plan, implement, and evaluate learning, which is explained by the two independent variables used in the research (Ansori et al.,

2021). At the same time, one has to take into account that the two variables have quite high correlation ($r = 0.949$). The high correlation between professional and pedagogical competence means that their combined explanatory power cannot be regarded as independent contribution of each variable.

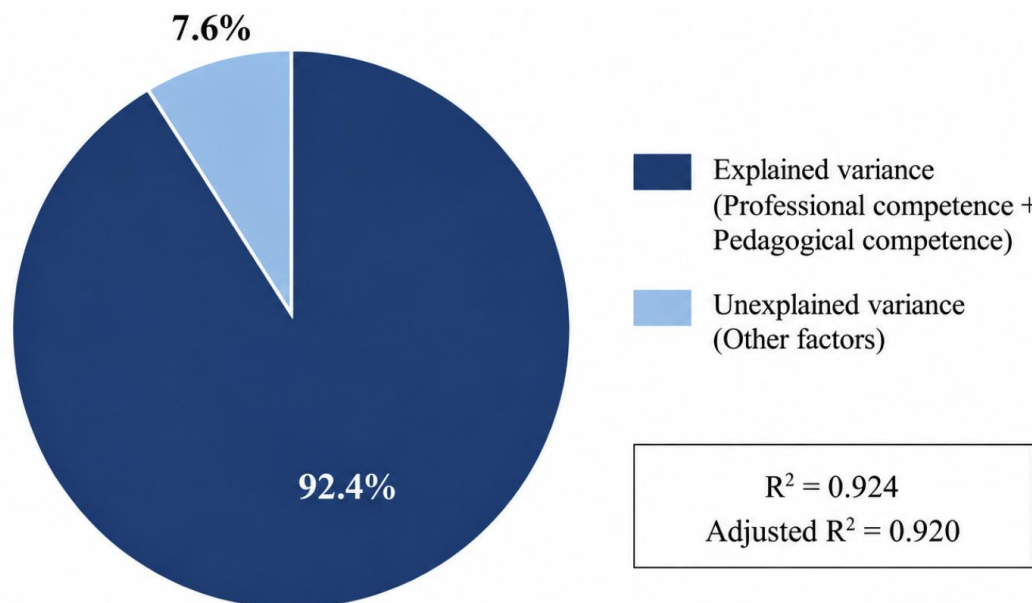


Figure 6. Explained and Unexplained Variance in Teacher Performance

Figure 6 illustrates visually the ability of the model to explain, on the one hand, the percentage of variation in teachers' performance that can be attributed to both professional and pedagogical competence and, on the other hand, the percentage of unexplained variation. The explained part of the variation accounts for 92.4% of the total variation, and 7.6% of it falls outside the scope of the explanatory power of the two predictors included in the model. It is worth noting that the model explains a significant portion of the variation in teacher performance, and at the same time, teacher performance cannot be fully described in terms of the two competences.

Unexplained 7.6% should not be considered only as an indicator of statistical error or insignificance of the other factors. The performance of teachers may be linked to a variety of personal, organizational, and contextual factors, such as motivation, work load, leadership, school atmosphere, professional support, teaching experience, organizational resources, and work conditions (Liakopoulou, 2011). These variables have not been included in the regression analysis of the present research. Thus, unexplained variation can indicate the need to add some more variables that may impact the performance of teachers.

Table 6. ANOVA Test of the Multiple Regression Model

Model Component	F-Statistic	Significance (p)	Decision	Interpretation
Professional Competence + Pedagogical Competence	218.002	< 0.001	Significant	The regression model is statistically significant
Residual/Error	—	—	—	Variation not explained by the model
Overall Model	218.002	< 0.001	Significant	Both predictors jointly relate significantly to teacher performance

Table 6 suggests that the multiple regression model is statistically significant because $F = 218.002$, $p < 0.001$. This means that the regression model comprising professional competence and pedagogical competence explains teacher performance using the predictors as opposed to being represented through the use of an intercept-only model (Afalla & Fabelico, 2020). Therefore, this finding is consistent with those discussed in Section b, in which both the individual competencies retained statistically significant partial regression coefficients.

The finding of the statistically significant F-test should be separated from causality. The

statistically significant overall regression model implies that the predictors together explain variance in the dependent variable through the statistical model. However, since the study used the correlational survey design, with the use of cross-sectional data, the finding does not imply temporal precedence nor does it imply the existence of the causal relationship (Batool et al., 2018). Instead, the findings provide a support for the association and explanatory relationship between the constructs of the interest.

The relationship between the competencies and teacher performance can be captured through an empirical model.

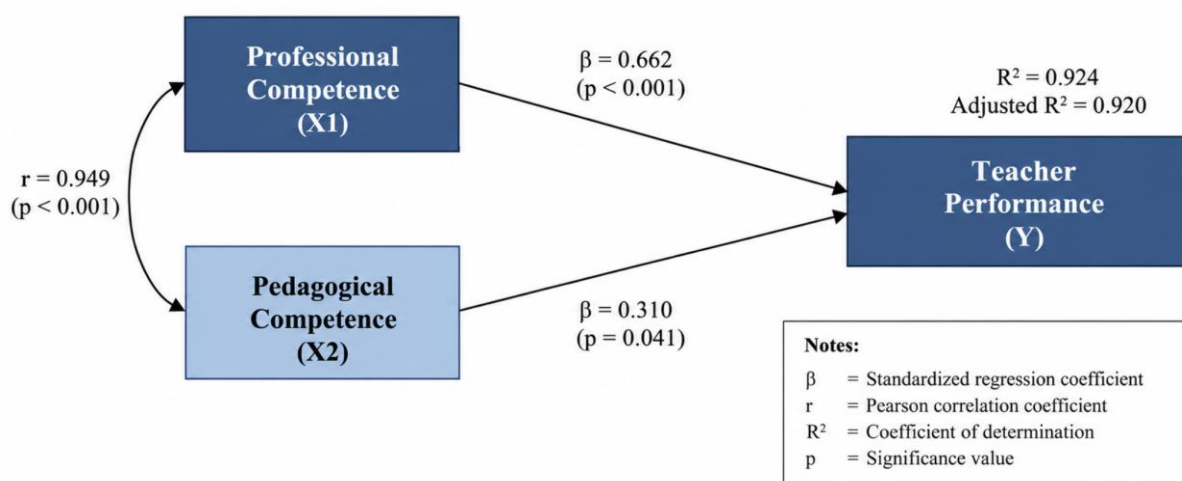


Figure 7. Integrated Regression Model of Professional Competence, Pedagogical Competence, and Teacher Performance

Figure 7 combines the key statistical results in a single empirical model. It shows the positive regression coefficients from professional competence and pedagogical competence to teacher performance, and the

bidirectional arrow between X_1 and X_2 illustrates their extremely high correlation ($r = 0.949$). Moreover, the model includes the total explanatory power of $R^2 = 0.924$. The presentation of these factors together in one

figure highlights the fact that the two competencies are statistically associated with teacher performance as well as with each other. This particular combination of elements is especially important because interpreting the competencies separately will ignore the considerable intersection of these predictors.

The integrated pattern is consistent with Human Capital Theory, according to which knowledge, skills, and abilities are forms of human capital that can be applied to produce productivity and performance (Becker, 1993). In the educational field, the professional and pedagogical competencies of teachers are types of professional human capital utilized during instructional activity. Schleicher (2018) emphasizes the role of teacher professional capacity in providing quality teaching and learning experiences. Accordingly, the considerable explanatory potential of the present model is consistent with the hypothesis that teachers' knowledge and competencies are significant components of their professional performance.

The finding can be explained in the framework of the concept of teacher quality. Darling-Hammond et al. (2004) emphasize the importance of teacher characteristics and professional capacity in terms of their connection with educational quality. Professional competence is the foundation upon which teachers gain the content knowledge, while pedagogical competence is related to the process of transforming the content into forms understandable by students. Shulman (1987) similarly emphasized the importance of teachers' content knowledge for the ability to translate it into forms suitable for teaching. Hence, the present findings provide empirical support for the view of professional and pedagogical competencies as interrelated dimensions of teacher capability.

The high R^2 needs to be combined with the predictor correlation and multicollinearity revealed earlier. Professional and pedagogical competence correlated at $r = 0.949$, while VIF values were 10.120 for both predictors. Therefore, 92.4% of explained variance should not be split into separate percentages for professional and pedagogical competence according to the regression coefficients (Utari et al., 2025). There is considerable overlapping part of their explanatory information. This point is critical because the goal of multiple regression analysis is not just adding up bivariate correlations, but estimation of the joint relationship among them.

Nevertheless, the simultaneous finding offers important empirical implication for professional development of teachers. According to the results, professional and pedagogical competencies should be seen as interconnected components rather than independent goals of competency development (Sudarwanto & Sulistyowati, 2019). Competency development programs focused on subject-matter mastery can be enhanced by applying it pedagogically, while pedagogical training can become more meaningful when teachers have enough knowledge about the subject-matter they teach. Such integrated professional development can provide a sustainable foundation for continuous improvement in teaching quality by connecting content mastery, instructional design, learning strategies, technology use, assessment, and reflective teaching practice.

Such integration is also consistent with the previous empirical evidence. For instance, Hakim (2015) found the positive relationship between teacher competence and teacher performance, while Großmann et al. (2025) also emphasized the role of teacher competence in teaching quality and

professional performance. The present study extended the empirical evidence by investigating the role of professional and pedagogical competence simultaneously in one regression model based on the sample of teachers from five public elementary schools in the same school cluster. Instead of considering the two competencies as unrelated predictors, the findings highlighted their high empirical interconnection and joint impact on teacher performance.

At the same time, the results indicated important research avenue. The exceptionally high correlation between professional and pedagogical competence raised a question about their empirical separation within the present measure (Fauziyah et al., 2022). The future research can use larger sample and more discriminative measure and apply the method of exploratory or confirmatory factor analysis to assess construct validity of the measures. Also, structural equation modeling could be used to estimate the relationships among competency dimensions while measuring the measurement error and latent constructs (Afandi et al., 2023). These methods can provide better empirical evidence on the difference between the constructs and their interrelationships.

Overall, the simultaneous regression analysis showed that professional and pedagogical competencies jointly provide considerable explanatory power of teacher performance in the present sample. The model is statistically significant ($F = 218.002$, $p < 0.001$), with $R^2 = 0.924$ and Adjusted $R^2 = 0.920$. Thus, the two competencies explain considerable part of teacher performance variance, while 7.6% is still unexplained by the predictors. However, the high correlation between the independent variables and the VIF values require careful interpretation of their individual contribution. Therefore, the main empirical implication of the findings is

not the fact that the teacher performance is explained solely by these two competencies, but that professional and pedagogical competence are closely interconnected dimensions significantly associated with teacher performance in the present sample population.

4. Conclusion

This study demonstrates that professional and pedagogical competence are significantly associated with teacher performance and provide an important foundation for strengthening effective, adaptive, and student-centered learning practices in elementary education. According to the results obtained, it can be stated that professional competence has a positive and statistically significant partial correlation with teacher performance ($B = 0.551$; $\beta = 0.662$; $p < 0.001$), while the partial correlation of pedagogical competence is also positive and statistically significant ($B = 0.245$; $\beta = 0.310$; $p = 0.041$). Together, in the simultaneous analysis, the two competency factors have been found to be statistically significant predictors of teacher performance through a regression model ($F = 218.002$; $p < 0.001$) with an R^2 of 0.924 and an Adjusted R^2 of 0.920, suggesting that the regression model accounts for 92.4% of variance in the observed teacher performance of the sample used in the current research study. Therefore, it can be said that teacher performance is highly dependent on the application of professional knowledge and skills and pedagogical skills in planning, implementation, and evaluation of teaching and learning activities. However, due to the very strong correlation between professional competence and pedagogical competence ($r = 0.949$) and VIF value of 10.120, there is a problem of multicollinearity that makes the interpretation of the individual predictors'

contributions difficult. Therefore, the findings support an integrated approach to teacher development in which professional knowledge and pedagogical competence are strengthened simultaneously to support meaningful learning design, technology-enhanced instruction, continuous improvement, and progressive learning practices in elementary education.

5. References

- Afalla, B., & Fabelico, F. (2020). Pre-service teachers' pedagogical competence and teaching efficiency. *Journal of Critical Reviews*.
- Afandi, M., Wahyuningsih, S., Yustiana, S., Kusumadewi, R. F., & Rachmadtullah, R. (2023). Correlation of Work Discipline and Pedagogical Competence to Teaching Performance in Elementary Teacher. *International Journal of Instruction*, 16(4), 189.
- Ansori, A., Suyatno, S., & Sulisworo, D. (2021). School principal's role in increasing teachers' pedagogical and professional competence in elementary schools in Indonesia. *Jurnal Akuntabilitas Manajemen Pendidikan*, 9(1), 98-112.
- Anwar, C. (2025). Teacher competence and student learning outcomes: A correlational study in primary education. *Journal of Literacy Education*, 1(3), 129-139.
- Batool, S., Tahir, T., & Habib, M. (2018). Relationship of teachers' professional competence and achievement of students at university level. *Turkish Journal of Teacher Education*, 7(1), 50-60.
- Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis, with special reference to education* (3rd ed.). University of Chicago Press.
- <https://doi.org/10.7208/chicago/9780226041223>
- Cahyana, A. B., Sembiring, M. G., & Syarifah, E. (2023). Pengaruh kompetensi pedagogik dan kompetensi profesional guru terhadap kinerja guru sekolah dasar di Kecamatan Secang, Kabupaten Magelang. *Jurnal Kewarganegaraan*, 7(1), 1-8.
- Cahyono, S., Saputro, R., & Radiana, U. (2020). Pengaruh kompetensi profesional dan pedagogik terhadap kinerja guru SMA Negeri Subrayon 2 Sanggau. *Jurnal Pendidikan dan Pembelajaran Khatulistiwa*, 9(1), 1-10.
- Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute.
- Delafini, R., Adiputra, S., & Badrun, M. (2025). Pengaruh kompetensi profesional dan kompetensi pedagogik terhadap kinerja guru. *Jurnal Ilmiah Ekonomi Manajemen*, 16(2), 1-10.
- Fauziyah, L., Yusuf, M., & Andayani, T. R. (2022, April). The relationship between pedagogical competence and teacher performance in inclusive school. In *International Seminar on Innovative and Creative Guidance and Counseling Service (ICGCS 2021)* (pp. 142-145). Atlantis Press.
- Großmann, L., Koberstein-Schwarz, M., Scholl, D., Krüger, D., & Meisert, A. (2025). Establishing common ground in empirical research on science teachers' lesson planning competence: A scoping review. *Studies in Science Education*, 61(2), 329-379. <https://doi.org/10.1080/03057267.2024.2415246>
- Haenilah, E. Y. (2015). Analisis kebutuhan profesionalisme guru sekolah dasar. *Sekolah Dasar*, 24(1), 1-10.

- Hakim, A. (2015). Contribution of competence teacher (pedagogical, personality, professional competence and social) on the performance of learning. *The International Journal of Engineering and Science*, 4(2), 1–12.
- Halimah, L. M. (2023). Analisis kompetensi pedagogik dan kompetensi profesional guru di sekolah dasar. *JAMP: Jurnal Administrasi dan Manajemen Pendidikan*, 6, 331–339. <https://doi.org/10.17977/um027v6i42023p331>
- Harmadi, F., Maryani, I., Sukirman, S., & Montano, E. C. N. (2025). Digital transformation: Exploring the relationship between literacy, motivation, and TPACK in elementary education. *Indonesian Journal on Learning and Advanced Education (IJOLAE)*, 295-311.
- Khamis, N. Y. (2019). A new competency-based framework for English for Specific Engineering Purposes (ESEP) practitioners. *The Asian EFL Journal*, 23(6.3), 46–65.
- König, J., Blömeke, S., Jentsch, A., Schlesinger, L., née Nehls, C. F., Musekamp, F., & Kaiser, G. (2021). The links between pedagogical competence, instructional quality, and mathematics achievement in the lower secondary classroom: König J. et al. *Educational Studies in Mathematics*, 107(1), 189-212.
- Liakopoulou, M. (2011). Teachers' pedagogical competence as a prerequisite for entering the profession. *European Journal of Education*, 46(4), 474-488.
- Lubis, P. R. (2025). *Pengaruh kompetensi pedagogik dan kompetensi profesional terhadap kinerja guru di sekolah menengah pertama (SMP) se-Kecamatan Perhentian Raja* [Tesis, Universitas Islam Negeri Sultan Syarif Kasim Riau]. Repository UIN Sultan Syarif Kasim Riau.
- Maghfiroh, A., Styati, E. W., Fachriza, A., Khoiriyah, K., Simpol, W., Syaputra, R. A., & Lathifah, L. (2024). Future-ready educators: assessing digital competence and teaching preparedness among prospective teachers in the 21st century. *Indonesian Journal on Learning and Advanced Education (IJOLAE)*, 47-61.
- Mamayoqubova, S., & Begmatova, D. (2023). Pedagogical conditions of developing professional competence of teachers of higher educational institutions. In *BIO Web of Conferences* (Vol. 65, p. 10025). EDP Sciences.
- Masrun, M., & Damrah, D. (2022). The Influence of Pedagogic and Professional Competencies on the Performance of Physical Education Teachers of Elementary Schools in Padang. *Kinestetik: Jurnal Ilmiah Pendidikan Jasmani*, 6(2), 381-388.
- Meiyanti, F., Hardienata, S., & Hidayat, N. (2022). The Correlation between self-efficacy and pedagogic competence with teacher teaching effectiveness. *Pedagonal: Jurnal Ilmiah Pendidikan*, 6(1), 107-119.
- Noviany, W. (2019). Kompetensi pedagogik dan profesional guru kelas V di SD Negeri Baciro Yogyakarta. *Jurnal Pendidikan Guru Sekolah Dasar*, 8(13), 1–10.
- Nursalim. (2017). Profesionalisme guru SD/MI. *Lentera Pendidikan*, 20(2), 250–264.
- Pamuji, S., & Limei, S. (2023). The Managerial Competence Of The Madrasa Head In Improving Teacher Professionalism And Performance At Mi Al-Maarif Bojongsari, Cilacap District. *Pengabdian: Jurnal Abdimas*, 1(2), 66-74.

- Ramadhan, S., Supriyadi, & Yuwono, A. (2025). Analisis kompetensi pedagogik guru profesional terhadap peningkatan kinerja guru di sekolah dasar. *Jurnal Publikasi Pendidikan*, 15(1), 1–8.
- Riwukore, J. R., & Habaora, F. (2021). The Influence of Competence and Work Motivation to Teacher Performance in Smp Negeri At Kota Kupang. *Ilkogretim Online*, 20(1), 1010.
- Rusilowati, U., & Wahyudi, W. (2020, March). The significance of educator certification in developing pedagogy, personality, social and professional competencies. In *2nd Social and Humaniora Research Symposium (SoRes 2019)* (pp. 446-451). Atlantis Press.
- Schleicher, A. (2018). *World class: How to build a 21st-century school system*. OECD Publishing. <https://doi.org/10.1787/9789264300002-en>
- Şentürk, C., & Zeybek, G. (2019). Teaching-Learning Conceptions and Pedagogical Competence Perceptions of Teachers: A Correlational Research. *Research in Pedagogy/Istraživanja u Pedagogiji*, 9(1), 65.
- Setiawan, D., Triyono, M. B., Sukarno, S., Nurtanto, M., Majid, N. W. A., & Abi Hamid, M. (2025). Assessing pedagogical competence of productive teachers in vocational secondary schools: a mixed approach. *Journal of Education and Learning (EduLearn)*, 19(2), 792-804.
- Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 57(1), 1–23. <https://doi.org/10.17763/haer.57.1.j463w79r56455411>
- Siri, A., Supartha, I. W. G., Sukaatmadja, I. P. G., & Rahyuda, A. G. (2020). Does teacher competence and commitment improve teacher's professionalism. *Cogent Business & Management*, 7(1), 1781993.
- Sudargini, Y., & Purwanto, A. (2020). The effect of teachers pedagogic competency on the learning outcomes of students. *Journal of Industrial Engineering & Management Research*, 1(4), 1-8.
- Sudarwanto, T., & Sulistyowati, R. (2019). The effect of pedagogic competence, professional competence, social competence, and teachers' personal competence on teachers' performance in marketing program. *KnE Social Sciences*, 982-987.
- Suyitno, T. (2018). Pengaruh hasil diklat, kompetensi pedagogik, dan kompetensi profesional terhadap kinerja guru. *Andragogi: Jurnal Diklat Teknis Pendidikan dan Keagamaan*, 6(1), 122–142. <https://doi.org/10.36052/andragogi.v6i1.51>
- Taniredja, T., & Abduh, M. (2016). Pedagogical, personality, social and professional competence in correlation with teachers' performance (Correlational study of junior high school teacher at SMPN 3 Purwokerto). *Proceeding ISETH (International Summit on Science, Technology, and Humanity)*, 264-272.
- Toom, A. (2017). Teachers' professional and pedagogical competencies: A complex divide between teacher work, teacher knowledge and teacher education. *The SAGE handbook of research on teacher education*, 2, 803-819.
- Umar, Y. O., & Mardesia, P. (2023). A Correlational Study: Pedagogical and professional competence of physical education teachers in relation to the implementation of the Merdeka

- curriculum. *Journal of Physical Education and Sport*, 23(12), 3325-3331.
- Utari, V. T., Maryani, I., Hasanah, E., Suyatno, S., Mardati, A., Bastian, N., ... & Reotutor, M. A. C. (2025). Exploring the intersection of TPACK and professional competence: a study on differentiated instruction development within Indonesia's Merdeka Curriculum. *Indonesian Journal on Learning and Advanced Education (IJOLAE)*, 136-153.
- Winursiti, N. M., Robandi, B., & Uyun, H. (2024). Kompetensi pedagogik guru sekolah dasar dalam pembelajaran abad 21: Menjawab tantangan dan kesenjangan. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, 9(1), 1-12.
- Zulkipli, D., Herlina, E., & Kurniawati, W. (2022). The impact of pedagogic, personality, professional, and social competence on teacher performance: A quantitative study. *International Journal of Management, Economic, Business and Accounting*, 1(3), 41-58.