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THE CONTRIBUTION OF DIGITAL *PROFESSIONAL LEARNING COMMUNITY* ACTIVITY STAGES TO TEACHER LEARNING PERFORMANCE COMPONENTS IN JAKARTA HIGH SCHOOLS

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Abstract: This study aims to analyse the contribution of digital Professional Learning Community (PLC) activity stages to the components of teacher learning performance in Senior High Schools (SMA) in DKI Jakarta. The three aspects of performance studied include: teacher learning performance (jargu), peer learning (jarse), and professional development (karpro). This study used a quantitative method with multiple regression design, involving 133 teachers from seven schools in five areas of Jakarta. The analysis showed that the implementation stage of digital PLC contributed the most to teachers' learning performance by 58.7%, while evaluation affected professional development by 58.2%, and planning contributed to peer learning by 40.6%. Overall, the regression model shows that all the variables of the digital PLC activity stages simultaneously have a significant positive effect on improving teacher learning performance, with a coefficient of determination of 79.2%. These findings highlight the importance of school support in facilitating digital PLC activities to improve teaching quality and teacher professionalism.

Keywords: Peer Learning Performance, Professional Development; Professional Learning Community; Teacher Learning Performance.

INTRODUCTION

In recent years, the development of digital technologies has brought significant transformations in various aspects of education, including in teacher professional development. Digital technology has brought changes to the nature and scope of education leading education systems around the world to adopt strategies and policies for ICT integration (Timotheou et al., 2023) . Digital-based *Professional Learning Community* (*PLC*) is one of the innovations adopted by schools to improve learning performance. The emergence of *PLC* digital platform not only facilitates communication and collaboration among teachers, but also provides access to various learning materials and evaluation data that can be used to improve learning performance.

The stages of *PLC* activities using digital platforms emphasise the element of collaboration between peers. Collaborative learning is deliberate and applied in learning supporting teachers to take responsibility for practising with fellow teachers (Botha, 2022) . Teachers' peer interactions in the workplace determine their learning practices, if not supported by school infrastructure (Shirrell et al., 2018)

. The necessary infrastructure is to facilitate teacher empowerment and team building by (a) mediating learning initiatives, (b) designing structures for curriculum enactment, and (c) creating opportunities for professional dialogue (Bryant et al., 2020) .

The stages of *PLC* activities supported by digital platforms in its application include three components, namely planning activities, implementation activities, and evaluation activities. Digital PLC planning activities include lesson planning, learning process, learning assessment and student mentoring. The three components are related to improving teacher learning performance including: (a) shared values and vision; (b) shared and supportive leadership; (c) collective learning and application of practice; (d) personal and shared practice, and (e) supporting conditions (S. M. Hord, 1997, 1998, 2008) .

There are approaches and strategies that can be applied to improve teachers' learning performance, such as inviting experts to introduce knowledge or guide practical training face-to-face (Ma et al., 2020) . Likewise, school leaders can have discussions with teachers and provide them with knowledge and insights as well as provide feedback and support to teachers (Torres, 2024) . Improving teachers' learning performance in particular can be done through continuous professional support (Sowndappan, 2023) .

As the education system evolves and is fuelled by technological advancements, teachers are faced with the challenge of continuously honing their digital literacy skills and integrating them into classroom learning. This process requires not only technical knowledge, but also structured pedagogical skills to make learning more effective (Buhl & Skov, 2021).

In this context, the Communities of Practice theory (Wenger, 1998) is a relevant theoretical foundation. This theory emphasises the importance of learning through active participation in communities, where members share practices, knowledge and experiences relevant to their professional tasks. The digital Professional Learning Community (PLC) adopts this concept by providing a collaborative platform for teachers to share best practices, improve pedagogical skills and strengthen their professional competence on an ongoing basis.

In addition, the Technological Pedagogical Content Knowledge (TPACK) approach (Mishra & Koehler, 2006) was used to analyse how teachers can integrate technology with learning content and teaching methods effectively. Through active participation in digital PLC, teachers can strengthen their ability to integrate technology into a more interactive and student-centred learning process.

Therefore, this study is based on the theoretical framework of Communities of Practice and TPACK, which aims to analyse the contribution of digital PLC activity stages to the improvement of teacher learning performance components. This approach is expected to provide practical insights in supporting teachers' professional development in the digital era

Along with the rapid development of digital technology, the education system is undergoing a significant transformation that demands an increase in teacher competence, especially in integrating technology into learning. According to an OECD report (2022), as many as 70% of schools around the world are shifting to using digital platforms as part of their learning strategy. This transformation is also reflected in Indonesia, where 65% of schools have implemented digital-based learning by 2023 (Kemdikbud, 2023).

One effective approach to improving teacher competence is through a digital Professional Learning Community (PLC). PLCs not only provide a collaborative space for teachers to share best practices, but also strengthen peer learning in a professional context (Botha, 2022). In this digital era, PLCs based on online platforms allow teachers to interact without the limitations of time and place, thus accelerating the exchange of knowledge and skills.

However, the challenges faced in implementing digital PLCs often relate to teachers' lack of readiness to utilise the technology as well as inadequate infrastructure (Liljekvist et al., 2021). Data from EdTech Magazine (2024) shows that only 48% of teachers feel confident in using digital platforms effectively in teaching.

This research seeks to fill the gap by analysing how the stages of digital PLC activities, which include planning, implementation and evaluation, can contribute to improving teachers' learning performance. Thus, this research focuses not only on understanding PLC concepts, but also on how PLC can be implemented effectively in the context of Indonesian schools to improve the quality of digital education

METHODS

Research Design

This research uses quantitative method with multiple regression analysis design. This method was chosen because it is suitable for analysing the relationship between several independent variables (stages of Professional Learning Community or digital PLC activities) to the dependent variable (teacher learning performance). Multiple regression analysis is able to evaluate the contribution of each stage, namely digital PLC planning, implementation, and evaluation, in influencing teacher learning performance in a measurable way.

The reason for using quantitative methods in this study is to obtain objective and measurable data regarding the effect of digital PLCs on teacher performance. The quantitative approach allows researchers to identify the extent to which the variables under study are interconnected, with results that can be tested statistically to reduce subjectivity bias (Creswell & Creswell, 2018).

Selection of Research Subjects

The subjects of this study were high school teachers in the DKI Jakarta area. The selection of respondents was based on the consideration that schools in this region have adopted digital platforms in teacher professional development activities, including PLCs. Jakarta was chosen because it is an area with better access to digital infrastructure, so that the implementation of digital PLCs is more optimal than other regions. Thus, the results of the study are expected to serve as a benchmark for schools in other regions that want to implement digital-based PLCs.

The respondents involved in this

study were 133 teachers from seven schools in five areas of Jakarta. The selection of respondents was carried out using purposive sampling technique, namely selecting teachers who actively participated in digital PLC activities for at least one year. This aims to ensure that respondents have sufficient experience in utilising digital PLC, so that the data obtained is more valid and relevant to the research objectives.

Data were collected through a questionnaire designed to measure teachers' perceptions of the stages of digital PLC activities and their contribution to learning performance. The questionnaire instrument was tested for validity and reliability to ensure the accuracy of the data collected. The validity test used item-total correlation, while the reliability was tested with Cronbach's Alpha coefficient, with the results showing a value above 0.70 which indicates the instrument is reliable (Ghozali, 2016).

Location and Research Subjects

The subjects of this study are high school teachers in DKI Jakarta who have been involved in digital PLC activities. The number of respondents in this study were teachers and principals who were selected as those who have actively participated in digital PLC. The number of respondents consisted of 133 people from 7 schools in 5 different areas of Jakarta namely SMAN 3 in South Jakarta, SMAN 8 in South Jakarta, SMAN 24 in Central Jakarta, SMAN 73 in North Jakarta, SMAN 113 in East Jakarta, SMAS Barunawati in West Jakarta and SMAS Pangudi Luhur in South Jakarta.

Data collection techniques and instruments

This study used a questionnaire instrument as the main tool to collect data. The questionnaire was designed to measure teachers' perceptions regarding the contribution of the digital Professional Learning Community (PLC) activity stages to their learning performance. Each questionnaire item used a 4-point Likert scale (1 = strongly disagree, to 4 = strongly agree) to obtain more measurable data and avoid respondent ambiguity

Data analysis techniques

Data analysis was carried out using multiple linear regression to estimate the causal influence between the variables that have been determined in the study. Regression analysis was conducted using the SPSS version 23.0 programme (Ghozali, 2016) between the variable stages of digital PLC activities (X) which includes the sub-variables of planning digital PLC activities ($X_{.1}$), implementing digital PLC activities ($X_{.2}$), and evaluating the results of digital PLC activities ($X_{.3}$) on improving teacher learning performance (Y). Regression analysis was conducted between the sub variables of teacher learning (jargu) ($Y_{.1}$), peer learning (jarse) ($Y_{.2}$), and professional development (karpro) ($Y_{.3}$) to analyse the contribution of each sub variable.

To ensure that the instruments used can produce accurate data, validity and reliability tests were conducted. The validity of the instrument was tested using item-total correlation analysis. Questionnaire items are considered valid if the correlation value (r count) is greater than r table (0.173) at a significance level of 5% with a sample size of 133 respondents. The validity test results show that all statement items have a calculated r value above r table, so they are declared valid.

The reliability of the instrument was tested using Cronbach's Alpha coefficient to evaluate the internal consistency of the questionnaire. Based on the tests conducted, this instrument obtained an Alpha Cronbach value above 0.70 for all sub-variables, which indicates that the instrument is reliable (Ghozali, 2016).

This study used purposive sampling technique, in which the sample was selected intentionally based on certain criteria. The research subjects were 133 teachers from seven senior high schools (SMA) in five areas of DKI Jakarta, who have actively participated in digital PLC activities for at least one year. The selection of respondents with this experience is done to ensure that the data obtained can provide a more accurate picture of the effectiveness of digital PLC in improving learning performance.

Data was collected by distributing questionnaires directly to respondents through an online platform to facilitate completion and reduce potential bias. Each respondent was provided with an explanation of the purpose of the study as well as instructions for completing the questionnaire, to ensure that the answers provided reflect their perceptions objectively.

RESULTS

Multiple Regressions Analysis

This study aims to analyse the contribution of digital *PLC* activity stages to improving teacher learning performance. The analysis was conducted on the variable stages of digital PLC activities which included sub-variables namely: planning, implementation and evaluation of digital *PLC* activities. The second variable is improving teacher learning performance, including sub-variables of teacher learning (jargu); peer learning (jarse); and professional work development (karpro).

a. Data Quality Test Results

Data were collected using a questionnaire as a research instrument. Each indicator of the research variable was given a closed answer option using a four-point Likert scale, from 1 to 4. The collected data was then analysed through validity and reliability tests to ensure the questionnaire was suitable for use.

1. Validity Test

An instrument is said to be *valid* if r-count> from r-table, then the statement item is valid at the Alpha 0.05 error level. The number of respondents is 133, then the r-table (N-2 = 131) is 0.173. The results of the validity test recapitulation in this research are presented in Table 1 as follows:

Table 1. Validity Test Results

Variables	Sub Variables	Grain	r count	r table	Ket
Digital *PLC* Activity Stages (X)	Digital PLC planning (X_1)	X.1.1	0.892	0.1703	valid
		X.1.2	0.896	0.1703	valid
		X.1.3	0.947	0.1703	valid
	Digital PLC implementation ($X_{.2}$)	X 2.1	0.932	0.1703	valid
		X 2.2	0.924	0.1703	valid
		X.2.3	0.957	0.1703	valid
	Digital PLC evaluation ($X_{.3}$)	X.3.1	0.914	0.1703	valid
		X.3.2	0.935	0.1703	valid
		X.3.3	0.951	0.1703	valid
Teacher Learning Performance (Y)	Teacher Learning (Jargu) (Y_1)	Y.1.1	0.940	0.1703	valid
		Y.1.2	0.915	0.1703	valid
		Y.1.3	0.947	0.1703	valid
		Y.1.4	0.930	0.1703	valid
	Peer Learning (Jarse) (Y_2)	Y.2.1	0.960	0.1703	valid
		Y.2.2	0.939	0.1703	valid
		Y.2.3	0.955	0.1703	valid
	Teacher Professional Development (Karpro) (Y_3)	Y.3.1	0.898	0.1703	valid
		Y.3.2	0.927	0.1703	valid
		Y.3.3	0.938	0.1703	valid
		Y.3.4	0.900	0.1703	valid

The validity test results in Table 1. above show that all sub-variables have r-calculated> from r-table (0.1703). This indicates that the statement items in the research instrument developed are valid.

2) Reliability Test

The reliability test for this research instrument uses Cronbach's Alpha value, which aims to evaluate the unidimensionality of the statement items on the latent variable under study. According to (Ghozali, 2016) , an instrument is considered reliable if its Cronbach's Alpha value is equal to or greater than 0.07. A recapitulation of the instrument reliability test results can be seen in Table 2 below:

Table 2 Item Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Digital PLC Activity Planning	58.41	55.228	.951	.962
Implementation of Digital PLC Activities	58.44	55.748	.898	.967
Digital PLC Activity Evaluation	58.44	55.172	.922	.964
Teacher Learning Performance (Jargu)	55.00	49.258	.913	.967
Peer Learning Performance (Jarse)	58.44	55.051	.916	.965
Performance of Teacher Professional Work Development (Karpro)	55.01	49.614	.906	.967

From the table above, data can be made in table 3 as follows:

Table 3. Reliability Test Results

Sub Variables	***Cronbach's Alpha***	Description
Digital PLC Activity Planning (X_1)	0,962 > 0,700	Reliable
Implementation of Digital PLC Activities (X_2)	0,967 > 0,700	Reliable
Digital PLC Activity Evaluation (X_3)	0,964 > 0,700	Reliable
Teacher Learning Performance (Jargu) (Y_1)	0,967 > 0,700	Reliable
Peer Learning Performance (Jarse) (Y_2)	0,965 > 0,700	Reliable
Professional Work Development Performance (Y_3)	0,967 > 0,700	Reliable

The results of the reliability test data in table 3 show that the Cronbach's Alpha value on all variables is above 0.70, so it can be concluded that all sub-variables are reliable to be used as research measuring instruments.

b. Classical Assumption Test Results

The classical assumption tests that must be met in simple linear regression analysis include Normality Test, Multicollinearity Test and Heteroscedasticity Test. The results of the classic assumption test in this study are as follows:

1) Data Normality Test

The normality test aims to determine whether the residuals from the regression model used follow a normal distribution or not. In this study, the normality test was carried out by testing the residuals using the Kolmogorov-Smirnov test. If the probability value of residual significance> 0.05, then the data is considered normally distributed. The results of the normality test can be seen in table 4 below:

Table 4. Normality Test Results *One-Sample Kolmogorov-Smirnov Test*

		Unstandardised Residual
N		133
Normal Parameters[a,b]	Mean	0E-7
	Std. Deviation	.51570331
Most Extreme Differences	Absolute	.326
	Positive	.326
	Negative	-.248
Kolmogorov-Smirnov Z		0.755
Asymp. Sig. (2-tailed)		.070
a. Test distribution is Normal.		
b. Calculated from data.		

Based on the analysis results in Table 4, the significance value 0.070> 0.05. Because the significance value of the Kolmogorov-Smirnov test can be concluded that the regression equation model is normally distributed.

2) Multicollinearity Test

The multicollinearity test aims to identify the correlation between independent variables in a regression model. A good regression model is one that shows no correlation between independent variables. To detect this correlation, the tolerance value and variance inflation factor (VIF) can be examined. If the tolerance value is more than 10% or VIF is less than 10, then the variables are considered free from multicollinearity. The multicollinearity test results in this study were carried out through 3 things, namely:

1. Multicollinearity test of planning, implementation and evaluation sub-variables on teacher learning performance (jargu) sub-variables, the results are shown in table 5.

Table 5. Multicollinearity Test Results of planning, implementation, evaluation of digital *PLC* activities and teacher learning performance (Y_1).

Coefficients[a]

Model		Unstandardised Coefficients B	Std. Error	Standardised Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	VIF
1	(Constant)	.319	.414		.771	.442		
	Digital PLC Activity Planning	.945	.116	.697	8.113	.000	.132	8.969
	Implementation of Digital PLC Activities	.254	.099	.191	2.564	.012	.148	6.750
	Digital PLC Activity Evaluation	.101	.083	.077	1.226	.223	.209	4.778

a. Dependent Variable: Teacher Learning Performance (Jargu)

Based on the analysis results in Table 5. Above, it can be seen that the *tolerance* value of the sub-variable digital *PLC* activity planning (X1), digital *PLC* activity implementation (X_2), digital *PLC* activity evaluation (X_3) is X> 0.100, and VIF < 10.00, which means that the regression equation model is free from multicollinearity.

b) Multicollinearity test of sub-variables of planning, implementation, evaluation and performance of peer learning (jarse), can be seen in table 6 below:

Table 6: Multicollinearity Test Results of planning, implementation, evaluation of digital PLC activities and peer learning performance (Y2).

Coefficients[a]

Model		Unstandardised Coefficients B	Std. Error	Standardised Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	VIF
1	(Constant)	.605	.442		1.367	.174		
	Digital PLC Activity Planning	.654	.124	.628	5.260	.000	.132	8.969
	Implementation of Digital PLC Activities	-.082	.106	-.081	-.778	.438	.148	6.750
	Digital PLC Activity Evaluation	.368	.088	.364	4.176	.000	.209	4.778

a. Dependent Variable: Peer Learning Performance (Jarse)

Based on the analysis results in Table 6 above, it can be seen that the *tolerance* values of the sub-variables digital *PLC* planning activities ($X_{1)}$, digital *PLC* implementation activities (X_2), digital *PLC* evaluation activities (X_3) are X > 0.100, and VIF < 10.00, which means that the regression equation model is free from multicollinearity.

c) Multicollinearity test of sub-variables of planning, implementation, evaluation and performance of teacher professional development (karpro) can be seen in table 7 below:

Table 7. Multicollinearity test results of planning, implementation, evaluation of digital *PLC* activities and professional development performance (Y_3).

Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.155	.514		2.249	.026		
	Digital PLC Activity Planning	.322	.144	.240	2.233	.027	.132	8.969
	Implementation of Digital PLC Activities	-.070	.123	-.053	-.568	.571	.148	6.750
	Digital PLC Activity Evaluation	.967	.102	.741	9.447	.000	.209	4.778

a. Dependent Variable: Performance of Teacher Professional Work Development (Karpro)

Based on the analysis results in Table 7 above, it can be seen that the *tolerance* value of the sub-variable digital *PLC* activity planning (X_1), digital *PLC* activity implementation (X_2), digital *PLC* activity evaluation (X_3) is X> 0.100, and VIF < 10.00, which means that the regression equation model is free from multicollinearity.

3) Heteroscedasticity Test

The heteroscedasticity test aims to determine whether there is a difference in residual variance between one observation and another in the regression model, which is tested using the Glejser test. A good regression model is one that does not show symptoms of heteroscedasticity or has a homogeneous variance. If the independent variable tested shows no significant effect or its significance value is more than 0.05 on the absolute residual value, then the regression model is considered not to contain symptoms of heteroscedasticity. The results of the heteroscedasticity test in this study were carried out through 3 things, namely:

a) Heteroscedasticity test of planning, implementation and evaluation sub-variables on teacher learning performance sub-variables (jargu), can be seen in table 8 below:

Table 8. Heteroscedasticity Test Results Jargu

Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.304	.322		.944	.347
	Digital PLC Activity Planning	.029	.091	.080	.325	.746
	Implementation of Digital PLC Activities	.046	.077	.084	.395	.602
	Digital PLC Activity Evaluation	.014	.064	.099	.324	.081

a. Dependent Variable: ABS_RES Teacher Learning Performance (Jargu)

In Table 8, it can be seen that the significance value of the digital *PLC* activity sub variable (X_1) is 0.746, the implementation of digital *PLC* activities (X_2) is 0.602, the evaluation of digital *PLC* activities (X3) is 0.081. This value is greater than 0.05, which means that there is no influence between the independent variables on the *absolute residual*. Thus, the regression model does not contain symptoms of heteroscedasticity.

2. Heteroscedasticity test of planning, implementation and evaluation sub variables on peer learning performance sub variables (jarse), can be seen in table. 9 below:

Table 9. Jarse Heteroscedasticity Test Results

Coefficients[a]						
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.785	.371		2.114	.036
	Digital PLC Activity Planning	.072	.104	.180	.694	.489
	Implementation of Digital PLC Activities	.165	.089	.418	.863	.065
	Digital PLC Activity Evaluation	.049	.074	.124	.655	.513

a. Dependent Variable: ABS_RES Peer Learning Performance (Jarse)

In Table 9, it can be seen that the significance value of the digital *PLC* activity sub variable (X_{1}) is 0.489, the implementation of digital *PLC* activities (X_2) is 0.065, the evaluation of digital *PLC* activities (X3) is 0.513> 0.05, which means that there is no influence between the independent variables on the *absolute residual*. Thus, the regression model does not contain symptoms of heteroscedasticity.

3. Heteroscedasticity test of the planning, implementation and evaluation sub-variables on the performance sub-variable of teacher professional work development (karpro), can be seen in table 10 below:

Table 10. Heteroscedasticity Test Results Karpro

Coefficients[a]						
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.553	.427		1.296	.197
	Digital PLC Activity Planning	.093	.120	.202	.772	.442
	Implementation of Digital PLC Activities	.149	.102	.331	1.460	.147
	Digital PLC Activity Evaluation	.042	.085	.093	.488	.626

a. Dependent Variable: ABS_RES Teacher Professional Development Performance (Karpro)

In Table 10, it can be seen that the significance value of the digital *PLC* activity sub variable (X_{1}) is 0.442, the implementation of digital *PLC* activities (X_{2}) is 0.147, the evaluation of digital *PLC* activities (X3) is 0.626> 0.05, which means that there is no influence between the independent variables on the *absolute residual*. Thus, the regression model does not contain symptoms of heteroscedasticity.

Based on the description in Tables 4, 5, 6, 7, 8, 9 and Table 10 above, shows that all classical assumption tests have been met, so the results of regression analysis are suitable for further discussion. Calculation of multiple linear regression coefficients is done by regression analysis through *SPSS* 27.0 *for Windows software*.

c. Hypothesis Test

1. Multiple Linear Regression Analysis Results: Digital *PLC* Activities on Teacher Learning Performance (Jargu), can be seen in Table 11 below:

Table 11: Results of Multiple Linear Regression Analysis of Digital PLC Activities on Teacher Learning Performance (Jargu)

Coefficients[a]						
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.273	.423		7.744	.000
	Digital PLC Planning	.190	.168	.134	2.128	.026
	Digital PLC Implementation	.406	.165	.219	1.859	.045
	Digital PLC Evaluation	.221	.095	.238	2.327	.021
a. Dependent Variable: Teacher Learning Performance (Jargu)						

Based on the results of multiple linear regression analysis as presented in Table 11, regression equation can be made as follows:

$Y_1 = (3.273 + 0.190\ X_1 + 0.406\ X_2 + 0.221\ X_3)X$

In the regression equation Y_1, it can be seen that the three sub-variables of digital *PLC* activities have significance values smaller than 0.05 ($X < 0.05$), indicating that all sub-variables contribute to teacher learning performance (jargu) (Y_1). Based on the regression equation, the following can be explained as follows:

a) A constant value of 3.273 means that if the digital-based *PLC* activity variable (X) remains fixed, teacher learning performance (jargu) (Y_1) will be affected by 32.73%.
b) The regression coefficient (b1) for digital *PLC* activity planning (X_1) of 0.190 shows a positive and significant effect. This means that if the planning of digital *PLC* activities is managed and improved, it has a contribution to improving teacher learning performance (Y_1) will increase by 19%.
c) The regression coefficient (b2) for the implementation of digital *PLC* activities (X_2) is 0.406, indicating a positive and significant effect. This means that if the implementation of digital *PLC* activities is managed and improved, it has a contribution to improving teacher learning performance (jargu) (Y_1) by 40.6%.
d) The regression coefficient (b3) for digital *PLC* activity evaluation (X_3) of 0.221 shows a positive and significant effect. This means that if the evaluation of digital *PLC* activities is managed and improved, it contributes positively to teacher learning performance (jargu) (Y_1) by 22.1%.
e) Of the three sub-variables of digital PLC activities, the digital PLC planning sub-variable (X_1) contributed most strongly at 40.6% to peer learning performance (jarse) (Y_2).

2. Results of Multiple Linear Regression Analysis: Digital PLC Activities on Peer Learning Performance (Jarse), can be seen in table 12 below:

Table 12. Results of Multiple Linear Regression Analysis of Digital PLC Activities on Peer Learning Performance (Jarse)

Coefficients[a]						
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.871	.455		6.308	.000
	Digital PLC Planning	.587	.181	.057	1.482	.031
	Digital PLC Implementation	.399	.177	.235	2.025	.045
	Digital PLC Evaluation	.326	.102	.322	3.187	.002

a. Dependent Variable: Peer Learning Performance (Jarse)

Based on the results of multiple linear regression analysis as presented in Table 12, regression equation can be made as follows:

$Y_2 = (2.871 + 0.587\ X_1 + 0.399\ X_2 + 0.326\ X_{(3)})\ X$

In the Y_2 regression equation, it can be seen that the three sub-variables of planning, implementation and evaluation of digital *PLC* activities have a significance value greater than 0.05 ($X < 0.05$), namely the sub-variable of planning digital *PLC* activities (X_1) with a significance of 0.031, the sub-variable of implementing digital *PLC* activities ($X_{(2)}$) with a significance of 0.045, the sub-variable of evaluating digital *PLC* activities ($X_{3)}$ with a significance of 0.002. This indicates that all of these sub variables have a significant effect on peer learning performance (jarse) (Y_2). Based on the regression equation, the following can be explained as follows:

a) A constant value of 2.871 means that if the digital *PLC* activities variable (X) remains constant, peer learning performance (jarse) (Y_2) will be affected by 28.71%. This value indicates that even if there is no perception of digital *PLC* activities, there is still a positive assessment of peer learning performance (jarse).
b) The regression coefficient (b1) for digital *PLC* activity planning (X_1) of 0.587 shows a positive and significant effect. This means that if the planning of digital *PLC* activities is managed and improved, the contribution to improving peer learning performance (jarse) (Y_2) will increase by 58.7%.
c) The regression coefficient (b2) for the implementation of digital PLC activities (X_2) is 0.399, indicating a positive and significant effect. This means that if the implementation of digital PLC activities is managed and improved, it has a contribution to improving peer learning performance (jarse) (Y_2) by 39.9%.
d) The regression coefficient (b3) for digital *PLC* activity evaluation (X_3) of 0.326 shows a positive and significant effect. This means that if the evaluation of digital *PLC* activities is managed and improved, it contributes to peer learning performance (jarse) (Y_2) by 32.6%.
e) Of these three sub-variables of digital PLC activities, the sub-variable of implementing digital PLC activities (X_2) contributed most strongly to peer learning performance (Y1), at 58.7%.

3. Multiple Linear Regression Analysis Results: Digital PLC Activities on Teacher Professional Work Development Performance (Karpro)

Table 13: Results of Multiple Linear Regression Analysis of Digital PLC Activities on the Performance of Teacher Professional Work Development (Karpro)

Coefficients[a]						
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.257	.423		7.705	.000
	Digital PLC Planning	.205	.168	.145	1.217	.026
	Digital PLC Implementation	.288	.165	.207	1.750	.022
	Digital PLC Evaluation	.582	.095	.197	1.913	.038

a. Dependent Variable: Professional Development Performance (Karpro)

Based on the results of multiple linear regression analysis as presented in Table 13, regression equation can be made as follows:

$Y_3 = (3.257 + 0.205\ X_1 + 0.288\ X_2 + 0.582\ X_{(3)})\ X$

In the regression equation Y_3 above, it can be seen that the three sub-variables have significance values smaller than 0.05 ($X < 0.05$). This indicates that the three sub-variables of digital PLC activities contribute positively to the performance of teachers' professional work development (karpro) (Y_3). Based on the regression equation above, the following can be explained as follows:

a) A constant value of 3.257 means that if the digital *PLC* activity variable (X) remains constant, the performance of developing teachers' professional work (Y_3) will be affected by 32.57%. This value indicates that even if there is no perception of digital *PLC* activities, there is still a positive assessment of the performance of developing teachers' professional work (Y_3).

b) The regression coefficient (b1) for digital *PLC* activity planning (X_1) of 0.026 indicates a positive and significant effect. This means that if the planning of digital *PLC* activities is managed and improved, it has a contribution to increasing the performance of developing teacher professional work (karpro) (Y_3) will increase by 20.6%, having a directly proportional relationship.

c) The regression coefficient (b2) for the implementation of digital PLC activities (X_2) is 0.288, showing a positive and significant effect. This means that if the implementation of digital PLC activities is managed and improved, it has a contribution to increasing the performance of developing teacher professional work (karpro) (Y_3) by 28.8%.

d) The regression coefficient (b3) for supervision of digital *PLC* activity evaluation ($X_{.3}$) of 0.582 shows a positive and significant effect. This means that if the evaluation of digital *PLC* activities is managed and improved, it contributes to the performance of teacher professional development (karpro) (Y_3) by 58.2%.

e) Of the three sub-variables, the digital PLC activity evaluation sub-variable (X_3) has the strongest contribution in influencing the performance of teacher professional work development (karpro) (Y_3) which is 58.2%.

d. Determination Test Results (R^2)

The coefficient of determination (R^2) is used to determine and measure the ability of the test model to explain the variation in the independent variable.

Using the *adjusted* R^2 value to evaluate which regression test model is the best. The results of the coefficient of determination test can be seen in the following table:

1. The coefficient of determination of the digital PLC activity sub-variable with teacher learning performance (jargu) is shown in table 14 below:

Table 14. Jarse Determination Coefficient Test Results (R^2)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.651[a]	.037	.792	.426

a. Predictors: (Constant), Digital PLC Evaluation, Digital PLC Implementation, Digital PLC Planning

The test results in Table 14 show that the adjusted R² value (coefficient of determination) on the sub-variable of digital *PLC* activities on teacher learning performance (jargu) is 0.792. This means that 79.7% in teacher learning performance (jargu) (Y_1) is significantly influenced by the variables of digital *PLC* planning activities ($X_{1)}$ and digital *PLC* implementation activities ($X_{2)}$ and digital *PLC* evaluation activities (X_3). The remaining 20.3% is explained by other factors not included in this study.

1. The coefficient of determination of the digital *PLC* activity sub-variable with peer learning performance (jarse), is shown in table 15 below:

Table 15. Jarse's Coefficient of Determination (R^2) Test Results

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.292[a]	.085	.565	.459

a. Predictors: (Constant), Digital PLC Evaluation, Digital PLC Implementation, Digital PLC Planning

The test results in Table 15 show that the adjusted R² value (coefficient of determination) on the sub-variable of digital *PLC* activities on peer learning performance (jarse) is 0.565. This means that 56.5% in peer learning performance (jarse) (Y_2) is significantly influenced by the variables of digital *PLC* planning activities ($X_{1)}$ and digital *PLC* implementation activities ($X_{2)}$ and digital *PLC* evaluation activities (X_3). The remaining 43.5% is explained by other factors not included in this study.

2. The coefficient of determination of the digital PLC activity sub-variable with the performance of professional work development (karpro) is shown in table 16 below:

Table 16. Test Results of the Coefficient of Determination (R^2) Karpro

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.225[a]	.050	.391	.427

a. Predictors: (Constant), Digital PLC Evaluation, Digital PLC Implementation, Digital PLC Planning

The test results in Table 16 show that the adjusted R² value (coefficient of determination) on the sub-variable of digital *PLC* activities on professional work development performance (karpro) is 0.391. This means that 39.1% of the variation in professional development performance (karpro) (Y_3) is significantly influenced by the variables of digital PLC planning activities ($X_{1)}$ and digital PLC implementation activities (X_2) and digital PLC evaluation activities (X_3). The remaining 60.9% is explained by other factors not included in this study.

e. Simultaneous Test Results (F Test)

The simultaneous test or F test, aims to determine whether all independent sub-variables in the digital *PLC* activity planning variable (X_1), digital *PLC* activity implementation (X_2) and digital PLC activity evaluation (X_3) as a whole are effective in predicting the contribution to improving teacher learning performance (jargu) ($Y_{1)}$. The results of the F test analysis in this study can be found in the table below.

1. The F test of the digital PLC activity sub-variable with teacher learning performance (jargu) is shown in table 17 below:

Table 17. F-test results of teacher learning performance (jargu)

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.624	3	.541	29.764	.034[b]
	Residuals	24.186	133	.182		
	Total	25.809	136			

a. Dependent Variable: Teacher Learning Performance (Jargu)
b. Predictors: (Constant), Digital PLC Evaluation, Digital PLC Implementation, Digital PLC Planning

The F test results show the calculated F value of 29.764> F table 2.67, and the significance value of P value 0.034 < α = 0.05, indicating that the test model in this study is valid. This means it indicates that the test model used can effectively project the contribution of the independent variable to the dependent variable, because the results are very good with a significance value of P-value 0.034.

2. The F test of the digital PLC activity sub-variable with peer learning performance (jarse), is shown in table 18 below:

Table 18. F-test results of peer learning performance (jarse)

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.618	3	.873	41.381	.003[b]
	Residuals	28.053	133	.211		
	Total	30.671	136			

a. Dependent Variable: Peer Learning Performance (Jarse)
b. Predictors: (Constant), Digital PLC Evaluation, Digital PLC Implementation, Digital PLC Planning

The F test results show the calculated F value of 41.381> F table 2.67, and the significance value of P value 0.003 < α = 0.05, indicating that the test model in this study is valid. This means it indicates that the test model used can effectively project the contribution of the independent variable to the dependent variable, very well with a significance value of P-value 0.003.

3. The F test of the digital *PLC* activity sub-variable with the performance of developing teacher professional work (karpro) is shown in table 19 below:

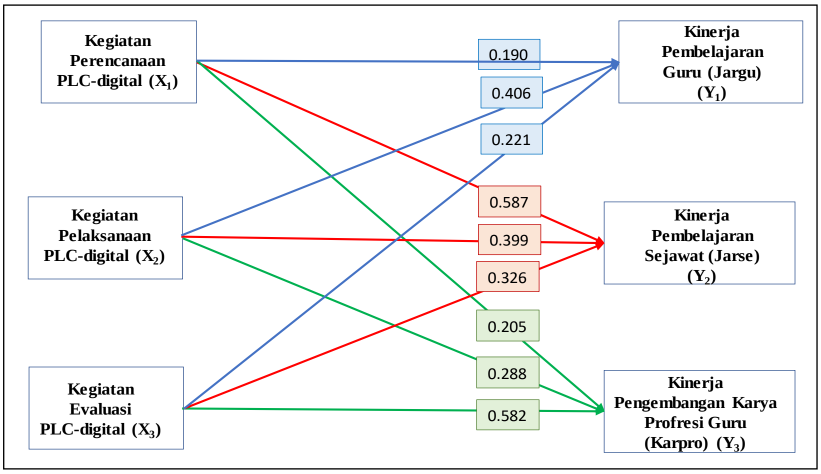
Table 19. F-test results of teacher professional development performance (karpro)

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.285	3	.428	23.354	.035[b]
	Residuals	24.199	133	.182		
	Total	25.484	136			

a. Dependent Variable: Professional Development Performance (Karpro)
b. Predictors: (Constant), Digital PLC Evaluation, Digital PLC Implementation, Digital PLC Planning

The F test results show the calculated F value of 23.354> F table 2.67, and the significance value of P value 0.035 < α = 0.05, indicating that the test model in this study is valid. This indicates that the test model used can effectively project the contribution of the independent variable to the dependent variable, very well with a significance value of P-value 0.035.

From the results of the multiple regression analysis presented above, the factors that directly support the contribution of digital PLC activities to teacher learning performance through digital *PLC* activities are described as follows:



From the figure above, it shows that all variables contained in the sub variables of digital *PLC* planning (X_1), digital *PLC* implementation (X_2) and digital *PLC* evaluation (X_3) contribute positively to teacher learning performance (jargu) (Y_1), peer learning performance (jarse) (Y_2) and teacher professional development performance (karpro) ($Y_{(3)}$). The sub-variable of digital *PLC* implementation activities (X_2) contributed most strongly to teacher learning performance (jargu) (Y_1). The sub-variable of digital *PLC* planning activities (X_1) contributes most strongly to peer learning performance (jarse) (Y_2), while the sub-variable of digital *PLC* evaluation activities (X_3) contributes most strongly to the performance of developing teachers' professional work (karpro) (Y_3).

DISCUSSION

The results show that the stages of digital *PLC* activities contribute positively to improving teachers' learning performance. Teacher involvement in the planning of digital PLC activities ensures that the objectives designed are clear and relevant, which supports the success of digital PLC implementation activities. The quality of digital PLC planning and implementation, although generally good, can be further improved by addressing technical issues following evaluation of digital *PLC* activities.

Digital Platform in *Professional Learning*

The development of digital technology today, one of which is the use of digital platforms in teacher professional development activities through the *Professional Learning Community* (*PLC*) has become an important part as one of the innovations adopted by schools. The importance of digital *PLC* is explained by (Botha, 2022) , that the implementation of digital *PLC* puts forward the element of collaboration between peers. The *platform* is used in the *PLC* process which is carried out *online* or online. Likewise, it is mentioned (Liljekvist et al., 2021) , that the development of digital platforms is used by teachers as a medium for *Professional Learning Community* activities as a means of encouraging improved teacher learning performance.

Teachers' active participation in the stages of the digital *PLC* activities showed that teachers felt involved and benefited from collaboration and shared learning. Constructive principal support helps to improve teacher participation and performance. On the other hand, (Lokman Mohd. Tahir & Mohammed Borhandden Musah, 2020) , explains that primary school teachers are satisfied with the implementation of *PLCs* in their schools, as it is an effective professional development, and creates a culture of teamwork and improves teachers' learning process.

The use of digital platforms in *PLC* activities still experiences several obstacles both in planning, implementation and evaluation. As mentioned by (Bragg et al., 2021) , that the obstacles faced in digital *PLC* are how to plan, implement, and evaluate the results of activities. These obstacles can be overcome through collaborative *PLC* activities. As explained (Botha, 2022) , that collaborative learning is deliberate and applied in learning supports teachers to take responsibility for practicing collaboratively with fellow teachers. This is also in accordance with the explanation of (Ni et al., 2023) , that the purpose of *PLC* activities is so that teachers do not work alone and build communication to foster collaboration and improve the quality of the learning process.

In this regard, it is also explained by (Denee, 2024) , that through learning communities, teachers can build confidence, focus on learning, opportunities for collaboration, and reflective learning. Through *PLCs* based on digital platforms, teachers have more opportunities and reach in improving collaboration between teachers. Mentioned by (Alwafi et al., 2020) , teachers can increase collaboration among teachers in digital-based PLCs to interact and develop their professionalism.

Digital PLC Activities and Teacher Learning Performance

The active role of teachers in digital *PLC* activities significantly contributes to improving teacher learning performance. The stages of digital PLC which include planning, implementation, and evaluation are in line with the explanation (Tai et al., 2023) , that the development of digital *professional learning communities* (*PLC*) in schools has a significant relationship with improving teacher learning performance in the classroom. The importance of learning performance is mentioned by (Zgenel, 2019) , because it will contribute to the quality of graduates.

The stages of digital PLC activities also have an important contribution in improving the quality of graduates. Through the stages of planning, implementation, evaluation, and digital-based application, *PLCs* implemented by teachers contribute to strengthening professional development and teacher learning performance. This is in line with the explanation (Prenger et al., 2021) , that *PLC* is a means of teacher learning, helping them collaborate, share best practices, and improve the overall quality of education.

Furthermore, it is explained by (Colognesi et al., 2020) , that through the implementation of digital PLCs, it will be easier to obtain peer support from teachers in their learning community, so as to create a climate of knowledge exchange that continues to grow. From the same point of view, it is also mentioned by (Karlberg & Bezzina, 2022) , that teachers who are members of digital-based *PLCs* collaborate more quickly and engage in efforts to ensure knowledge exchange and continuous self-development.

Based on the above references, teacher learning performance is actually related to three main domains, namely: lesson planning, lesson implementation, evaluation of learning outcomes and guidance to students. The three main domains of teacher learning performance can be significantly improved through digital PLC activities carried out by teachers. This result is in line with the explanation (Boateng & Nyamekye, 2022) , that *PLC* activities supported by digital platforms are important activities and can improve teacher learning performance.

The role of the principal in this case to support teachers in planning, implementing and evaluating digital *PLC* activities, will provide an impetus to teacher job satisfaction, as mentioned (Zhang et al., 2023) . It takes awareness and commitment of teachers' work supported by principals who are able to provide an effective and positive influence on the school ecosystem for the realisation of resilient, competent and quality human resources (Efendi et al., 2023) . Principal support will foster teacher self-efficacy and job satisfaction in carrying out tasks and improve teacher learning performance (jargu), peer learning (jarse) and professional work development (karpro).

The results of this study show that teachers' participation in digital Professional Learning Community (PLC) activities contributes significantly to improving their learning performance. The stages of PLC activities that include planning, implementation, and evaluation are proven to have a positive effect on three main aspects: teacher learning performance, peer learning, and professional development.

The greatest contribution was found in the implementation stage of digital PLCs, which significantly improved teachers' learning performance in the classroom. This finding is in line with the Communities of Practice theory (Wenger, 1998), which emphasises the importance of collaboration within professional communities to improve skills and knowledge. Through digital collaboration, teachers can exchange best practices, get constructive feedback and improve their pedagogical skills more effectively (Botha, 2022).

In addition, the Technological Pedagogical Content Knowledge (TPACK) approach (Mishra & Koehler, 2006) supports this finding, where the integration of technology in learning activities through digital PLCs allows teachers to better integrate content, pedagogy and technology. This has a direct impact on improving the quality of learning in the classroom, which in turn contributes to the achievement of better student learning outcomes.

From a practical perspective, these findings highlight the importance of school support in providing adequate technological infrastructure as well as ongoing training for teachers. Principals and education managers need to encourage teachers' participation in digital PLCs, not only as a form of professional development, but also as a strategy to create a sustainable culture of collaboration. With such support, teachers are expected to be more confident in using technology to optimise learning in the classroom (Liljekvist et al., 2021).

Overall, this study shows that the implementation of digital PLCs not only impacts on improving teachers' individual competencies, but also strengthens peer collaboration. This is relevant to previous research which states that participation in PLCs can improve teacher job satisfaction and teaching quality (Zhang, Yin, & Wang, 2023).

CONCLUSIONS

This study shows that digital Professional Learning Community (PLC) activities have a significant contribution to improving teacher learning performance. The results of multiple regression analysis show that the implementation stage of digital PLC contributes the most to improving teacher learning performance (58.7%), followed by the evaluation stage which affects professional development (58.2%), and the planning stage which has an impact on peer learning (40.6%). These findings underscore the importance of integrating digital-based PLCs within the school environment to support teachers' continuous professional development. Through digital collaboration, teachers can share best practices, get constructive feedback, and improve their pedagogical and digital competencies. This is in line with the Communities of Practice theory (Wenger, 1998) that emphasises learning through collaboration, as well as the TPACK approach (Mishra & Koehler, 2006) in integrating technology into teaching practices. Based on the results of the study, it is recommended that school principals and education managers be more proactive in facilitating digital PLC activities. This includes the provision of adequate infrastructure, regular training, as well as technical support to ensure teachers can utilise digital platforms effectively. Thus, digital PLC activities can become an integral part of professional development in schools. This study has limitations in the context of the DKI Jakarta area and the subject of high school teachers, so the results may not be generalised to other regions. Therefore, further research can be conducted by expanding the coverage area and involving various levels of education to get a more comprehensive picture. In addition, future research can explore other factors that influence the effectiveness of digital PLCs, such as school culture, leadership, and technology readiness. With further research, it is hoped that a more effective approach in utilising digital PLCs can be found to improve the quality of education in Indonesia more thoroughly.

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