Primary: Jurnal Pendidikan Guru Sekolah Dasar
journal homepage: https://primary.ejournal.unri.ac.id/
contents lists available at SINTA and DOAJ

Vol. 15 No. 1 (2026): February
http://dx.doi.org/10.33578/jpfkip.v15i1.122-136

The relationship between pedagogical competence and teacher self-efficacy on the ability to implement differentiated learning in public elementary schools

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Article info

Keywords: differentiated learning, pedagogical competence, teacher self-efficacy

Abstract

This study examines the relationships among pedagogical competence, teacher self-efficacy, and the ability to implement differentiated learning among public elementary school teachers in Cluster 04, Jetis. The study employed a quantitative correlational design with an ex post facto approach. The study population comprised all teachers in public elementary schools in Cluster 04 Jetis and was drawn using simple random sampling. The instrument was a closed questionnaire that had been tested for validity and reliability. Data analysis was conducted using multiple linear regression. The results indicate that pedagogical competence and teacher self-efficacy are significant predictors of differentiated learning implementation, both as partial and as simultaneous predictors. In the partial analysis, pedagogical competence emerged as a strong positive predictor ($\beta = 1.301$, $p < .05$), whereas teacher self-efficacy exhibited a significant negative relationship ($\beta = -.543$, $p < .05$). The simultaneous test yielded a significant model ($F = 62.271$, $p < .05$), with a coefficient of determination (R^2) of .762, indicating that the two variables collectively account for 76.2% of the variance in differentiated learning implementation. These findings suggest that while high pedagogical mastery is essential for adaptive instruction, general professional confidence without technical calibration may not yield optimal results. This research strengthens the scientific basis for teacher capacity development to improve the quality of adaptive learning in elementary schools.

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DOI: http://dx.doi.org/10.33578/jpfkip.v15i1.122-136
Received 2 December 2025; Received in revised from 30 January 2026; Accepted 1 February 2026
Available online 28 February 2026
e-ISSN 2598-5949 | p-ISSN 2303-1514

1. Introduction

The dynamics and complexity of education in the 21st century demand adaptation to developments in science and technology, as well as the diversity of student characteristics. The "Independent Curriculum" ("*Kurikulum Merdeka*") is designed to address these dynamics and complexities. The Independent Curriculum has a more adaptive and student-centered vision. This curriculum provides a more flexible approach to lesson planning, enabling teachers to tailor materials to students' abilities and learning environments (Ulfah et al., 2025).

A fundamental aspect of providing quality education is the teacher's ability to understand and accommodate individual differences between students. One approach focused on accommodating these individual differences is differentiated learning. Differentiated learning emphasizes that each child has different interests, talents, potential, and learning styles. Learning is student-centered, with the teacher acting as a guide and facilitator (Hasanah & Sukartono, 2024). Teachers can consider and adjust aspects of differentiation, content, process, product, and learning environment based on students' readiness, interests, and learning profiles (Maulidiawati & Darmawan, 2024). Thus, differentiated learning can increase engagement, learning achievement, and equitable learning outcomes if implemented consistently (Langelaan et al., 2024).

The successful implementation of differentiated learning is inseparable from the competencies teachers must possess. One of these is pedagogical competence. Pedagogical competence is the ability to manage student learning, encompassing understanding students, designing and implementing learning, evaluating learning outcomes, and developing students to actualize their various potentials (Apriyantika & Mustika, 2023). Teachers with strong pedagogical competence are considered more capable of designing lesson plans that accommodate differences in student characteristics and to apply various learning methods to support differentiated instruction, particularly in the elementary school context. This aligns with Marzoan (2023), who stated that differentiated learning will be successful if supported by teachers' competence in its implementation. Teachers play a key role in implementing effective differentiated learning; therefore, the level of teacher pedagogical competence is crucial.

In addition to teacher competence, personal factors within teachers, such as self-efficacy, also play a crucial role in learning practices, including differentiated learning. Self-efficacy is a person's belief in their ability to carry out the actions necessary to achieve specific outcomes. Self-efficacy is a teacher-level construct characterized by high confidence in their ability to perform their duties successfully. These duties include educating, teaching, guiding, directing, training, assessing, and evaluating students at the elementary level. Teacher self-efficacy encompasses good habits such as discipline, honesty, responsibility, perseverance, and patience, grounded in workplace ethics (Putri et al., 2023).

The role of each variable has been empirically studied in recent years to better understand the complex relationships among variables in the Indonesian educational environment. Rigianti (2023) argues that the primary advantage of differentiated instruction is its ability to address student differences in a diverse classroom by modifying both content and instructional processes. Studies conducted by Astuti et al. (2023) at the elementary school level found that this flexible instructional approach significantly improves student achievement and character development. However, the successful implementation of these forms of instruction depends greatly on the quality of educators' input. Suryani (2023) points out that pedagogical competence must be intentionally developed through coaching and supervision. Similarly, Yasni (2023) observed that many contemporary educators continue to use traditional instructional management techniques, which can hinder students' access to instruction aligned with current

[e-**ISSN** 2598-5949 | p-**ISSN** 2303-1514]

standards. In addition to technical competencies, Rosalina et al. (2025) found that psychological factors (e.g., self-efficacy) play an essential role in motivating students to learn and promoting professional commitment among educators.

However, findings in the field indicate that elementary school teachers still face various obstacles in implementing differentiated learning. Previous case studies in elementary schools indicate that limitations in pedagogical competence make teachers less able to analyze student learning needs and design flexible learning (Faishal & Ahmadi, 2025). On the other hand, low teacher self-efficacy is also related to teachers' confidence in trying strategies that require high creativity and adaptation (Minarni, 2020).

Preliminary interviews at SDN 2 Patalan and SDN 2 Sumberagung illustrate that a major impediment to implementing differentiated learning methods is the inadequate training and support available to teachers to allow them to implement differentiated teaching successfully, and that, ultimately, this leads to a lack of confidence and limited mastery of adapting to individual students' needs. With respect to the broader issues identified by researchers, the local issue experienced by Cluster 04 Jetis elementary schools mirrors the broader concern regarding the implementation of differentiated instruction in the classroom. Smale-Jacobse et al. (2019) indicate that although differentiated instruction is fundamental to meeting learners' varying needs, a teacher's ability to differentiate depends on their proficiency and expertise in applying pedagogically relevant instructional practices. Ramli and Yusoff (2020) also found that self-efficacy is an essential motivating factor for teachers to initiate changes to educationally instruct students in a differentiated manner. Nonetheless, a significant gap continues to exist within the research that examines the convergence of pedagogical competency and self-efficacy and the challenges faced by teachers when attempting to develop ways to address the differences among students within the same classroom and how these can be mitigated through increased self-efficacy, which has been shown to frequently deter teachers from using these instructional strategies in a productive way (Haelermans, 2022). Previous research has examined each variable separately; however, there is a paucity of literature on the combined effects of these variables in the context of elementary school clusters. Therefore, the purpose of this study is to investigate how pedagogical competencies and teacher self-efficacy affect the implementation of differentiated learning in Cluster 04 Jetis elementary schools, both individually and collectively, to develop a more comprehensive model for teacher professional development.

Cluster 04 Jetis was selected as the research site because it serves as a model for elementary education in Bantul. In addition, preliminary discussions were held with the Cluster 04 working group, which emphasized the urgent need to assess the implementation of differentiated instruction following recent professional development initiatives in this region. This provided current and relevant context for this study.

Based on the initial findings, this study aims to examine the contribution of pedagogical competence (X_1) and teacher self-efficacy (X_2) to the implementation of differentiated learning (Y). Specifically, this research seeks to address the following hypotheses:

H1: There is a significant partial relationship between pedagogical competence (X_1) and the ability to implement differentiated learning (Y).

H2: There is a significant partial relationship between teacher self-efficacy (X_2) and the ability to implement differentiated learning (Y).

H3: There is a significant simultaneous relationship between pedagogical competence (X_1) and teacher self-efficacy (X_2) toward the ability to implement differentiated learning (Y).

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2. Literature Review

Differentiation in education is grounded in the constructivist theory. The student is at the center of the educational process, according to Tomlinson (2014). Therefore, differentiation must be more than a technological operation. A very high level of pedagogical competence in identifying students' diverse needs, along with the persistence to work with the complexity of adaptive teaching, is necessary to ensure the success of differentiation (König et al., 2021).

Pedagogical competency provides the technical foundation for differentiated instruction. The pedagogical competency includes the ability to reflect on how to adapt the strategy to students' diversity, as stated in the 2007 Minister of National Education Regulation, and further elaborated by Mulyasa (2015). While Hattie (2008) identified pedagogical competency as a major determinant of student achievement, recent empirical studies by Wulandari and Sudrajat (2025) confirmed its direct relationship to differentiated learning (R = .74). It, therefore, is the teacher's ability to integrate objectives, teaching strategies, and assessment/diagnostic tools. As specified by Anderson and Krathwohl (2001), these represent the conditions to create flexible content and processes that are needed to design a differentiated classroom.

While technical skills are essential, it is equally crucial that a teacher possesses the self-efficacy to sustain their motivation. According to Bandura (1997), Social Cognitive Theory, self-efficacy is defined as teachers' sense of their ability to organize and execute their teaching behaviors to meet their goals. A teacher's self-efficacy determines whether they will persist in using new strategies. Zaman (2024) defines self-efficacy as relating to innovative pedagogies, such as those used under the Merdeka Curriculum. Teachers with high self-efficacy are not only more likely to be receptive to educational innovations but also better able to maintain instructional quality and classroom control as they transition from a teacher-centered to a student-centered approach to education (Zee & Koomen, 2016).

The analysis of those variables impies that when teachers have the ability to use pedagogy to do assessment and have the beliefs about their ability to create a heterogeneous classroom environment, the resulting instructional strategies become more formal and more effective (Anwar et al., 2024), which results in better equity among students at the elementary school level (Van Geel et al., 2019). Based on this synthesis, the conceptual framework (Figure 1) illustrates that pedagogical competence and self-efficacy are the same construct and can be used together as predictive factors of a teacher's job performance.

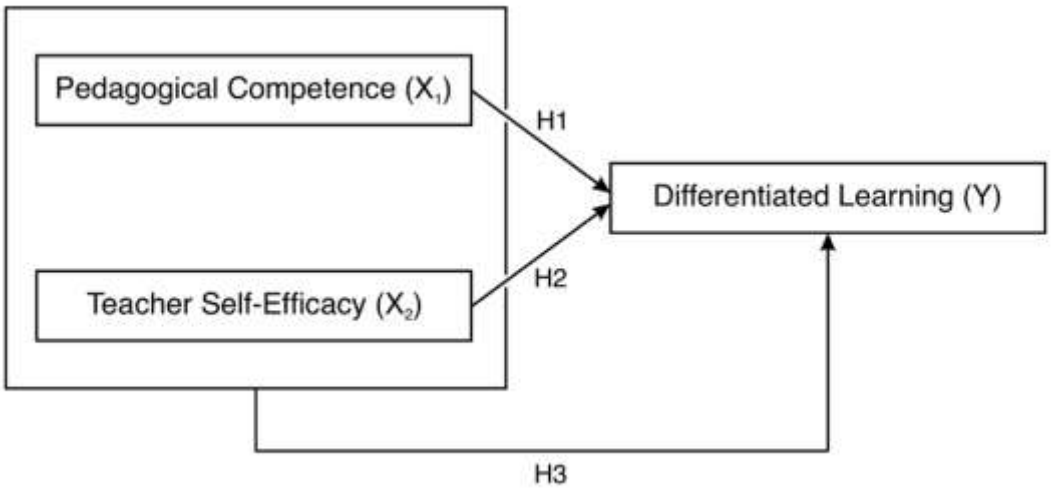

Figure 1. Conceptual framework

3. Methods

This research employed a quantitative approach. The research employed a descriptive, correlational, quantitative design. Tanzeh (2011) stated that a quantitative approach aims to test theories, establish facts, demonstrate relationships between variables, provide statistical descriptions, estimate, and predict outcomes. Furthermore, the research employed an ex post facto (non-experimental) design. According to Sugiyono (2011), ex post facto research is conducted to study an event and then review it to identify factors that may have caused it.

The research population was all elementary school teachers in Cluster 04 Jetis, Bantul. A population is a general area consisting of objects or subjects with certain qualities and characteristics that the researcher determines, and from which conclusions are drawn (Sugiyono, 2011). The research sample was drawn using simple random sampling, in which units are selected at random without regard to population proportions. The research sample consisted of 42 teachers.

Data were collected using a closed-ended questionnaire structured based on indicators for each variable. Each item was measured using a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). This scale allowed researchers to obtain quantitative data regarding teachers' perceptions of their pedagogical competence, self-efficacy, and ability to implement differentiated learning.

Before being used in the main study, the questionnaire instrument was tested for validity and reliability on 30 teachers in Cluster 01 Jetis. Validity testing was conducted using the Pearson product-moment correlation in SPSS version 26 to ensure that each item correlated significantly with the total score. The results of the validity testing are presented in Table 1. A questionnaire item was declared valid when the calculated r-table value was greater than the r-table value. The critical r-table value was determined using a significance level of 5% (α =.05) and degrees of freedom df = 28 (n - 2). For a sample of n = 30, the required threshold for validity was 0.3610.

Three research instruments were developed for this study. The Pedagogical Competence scale was adapted from the indicators in the Regulation of the Minister of National Education No. 16 of 2007 and based on Larasati and Gafur (2018). Teacher Self-Efficacy was based on Bandura's (1997) theory as operationalized by Zaman (2024) and Putri et al. (2023). Finally, the ability to implement Differentiated Learning was adapted from the dimensions established by Tomlinson (2014) and Juita et al. (2024).

Table 1. Results of the validity test of the pedagogical competence, teacher self-efficacy, and ability to implement differentiated learning instruments

Question Items	r_{count} (Pedagogical Competence)	Description	r_{count} (Teacher Self-Efficacy)	Description	r_{count} (Ability to Apply Differentiated Learning)	Description
1.	.532	Valid	.782	Valid	.520	Valid
2.	.543	Valid	.772	Valid	.759	Valid
3.	.510	Valid	.776	Valid	.554	Valid
4.	.728	Valid	.793	Valid	.666	Valid
5.	.671	Valid	.589	Valid	.759	Valid
6.	.664	Valid	.728	Valid	.591	Valid
7.	.463	Valid	.648	Valid	.687	Valid
8.	.459	Valid	.811	Valid	.512	Valid

Question Items	r_{count} (Pedagogical Competence)	Description	r_{count} (Teacher Self-Efficacy)	Description	r_{count} (Ability to Apply Differentiated Learning)	Description
9.	.722	Valid	.550	Valid	.854	Valid
10.	.752	Valid	.784	Valid	.641	Valid
11.	.896	Valid	.618	Valid	.822	Valid
12.	.597	Valid	.363	Valid	.641	Valid
13.	.498	Valid	.760	Valid	.183	Not Valid
14.	.704	Valid	.751	Valid	.683	Valid
15.	.648	Valid	.748	Valid	.727	Valid
16.	.818	Valid	-	-	.402	Valid
17.	.413	Valid	-	-	.552	Valid
18.	.310	Not Valid	-	-	.768	Valid
19.	.802	Valid	-	-	.595	Valid
20.	.489	Valid	-	-	.597	Valid
21.	.862	Valid	-	-	-	-
22.	.763	Valid	-	-	-	-
23.	.736	Valid	-	-	-	-
24.	.848	Valid	-	-	-	-
25.	.887	Valid	-	-	-	-

Based on the results in Table 1, it can be concluded that the pedagogical competency questionnaire contains one invalid item, item 18. All items in the teacher self-efficacy questionnaire are declared valid. Meanwhile, the differentiated learning ability questionnaire contains one invalid item, item 13. Valid items are subsequently used in the study and tested for reliability, while invalid items are removed.

After ensuring that the questionnaire met the validity criteria, a reliability test was conducted (Table 2). Reliability testing was performed using Cronbach's alpha (α). An instrument is considered reliable if α > .60.

Table 2. Results of the reliability test

Instruments	Cronbach's Alpha	N of Items
Pedagogical Competence	.748	24
Teacher Self-Efficacy	.927	15
Ability to Implement Differentiated Learning	.922	19

Reliability testing (Table 2) yields Cronbach's alpha coefficients of .748 for pedagogical competence, .927 for teacher self-efficacy, and .922 for the ability to implement differentiated learning. All values exceed the .60 threshold, confirming the internal consistency of the instruments. The final questionnaire comprises 24 items on pedagogical competence, 15 on self-efficacy, and 19 on the implementation of differentiated learning. For data analysis, this study employed multiple linear regression. Multiple regression analysis is used to determine the effect of two or more independent variables on a single dependent variable simultaneously (Riduwan &

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Sunarto, 2007). However, prior to this, the researcher conducted prerequisite analyses, namely tests of normality, linearity, and multicollinearity. The significance threshold used for all analyses was .05. The researchers adhered to high-quality ethical guidelines throughout the study. Each participant was fully informed about the research, how their information would be kept confidential, and that they could withdraw at any point during the study without consequence. Each signed an informed consent agreement before data collection on the teachers began. Since anonymity was guaranteed, data were processed in aggregate, and no teacher's identity was disclosed in this study.

4. Results

Following the validation and reliability testing, the final instrument was distributed to the 42 sampled teachers in Cluster 04 Jetis. The descriptive analysis in Table 3 elucidates that the teachers in Cluster 04 Jetis have an extremely high, well-balanced level of professional readiness. One of the most essential findings was that the mean scores for pedagogical competence (X_1) and teacher self-efficacy (X_2) were equal at 4.18, indicating that teachers' technical knowledge of instructional methods has developed in parallel with their psychological confidence in their teaching abilities. The extremely high level of professionalism is also evidenced by the fact that numerous faculty members have reached the maximum possible score (i.e., 5.00), suggesting mastery in the areas measured. It appears there might be a small gap in the implementation of differentiated learning (Y), since the mean score for this measure was slightly lower than for the other two measures at 4.07. Although still considered high, the score indicates that teachers are theoretically capable and personally confident, but there are practical difficulties in implementing adaptable instruction that slightly exceed their typical skill levels. The consistently low standard deviations (all less than .40) for each variable confirm that the sample is highly homogeneous, supporting a uniform professional culture within the cluster.

Table 3. Descriptive statistics (n = 42)

Variables	Mean	Min.	Max.	Std. Dev.
Pedagogical Competence (X_1)	4.18	3.46	5.00	.375
Teacher Self-Efficacy (X_2)	4.18	3.60	5.00	.370
Ability to Implement Differentiated Learning (Y)	4.07	3.42	4.79	.382

Data are subsequently subjected to several statistical prerequisite tests to ensure suitability for parametric analysis, as required by Sugiyono (2011). These include tests for normality (Table 4), linearity (Table 5), and multicollinearity (Table 6). Confirming these assumptions is essential to ensure that the data for each variable follows a normal distribution and meets the requirements for multiple linear regression.The results of the One-Sample Kolmogorov-Smirnov normality test (Table 4) yield an Asymp. Sig. (2-tailed) value of .134. Since $p > .05$, the null hypothesis is accepted, indicating that the residuals in this study are normally distributed.

Table 4. Normality test results (one-sample kolmogorov-smirnov test)

Statistics	Values
N	42
Mean	.0000000
Std. Deviation	3.941
Asymp. Sig. (2-tailed)	.134

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Table 5 presents the results of the linearity testing for H1 and H2. The linearity test assesses whether the distribution of research data follows a linear model (Winarsunu, 2017), a prerequisite for multiple regression. A relationship is considered linear if the Sig. The deviation from linearity exceeds 0.05. The testing yields significance at p = 0.051 for the relationship between pedagogical competence and differentiated learning (H1) and at p = 0.162 for the relationship between teacher self-efficacy and differentiated learning (H2). Therefore, both independent variables meet the linearity assumption, confirming that a linear model is appropriate for further regression analysis.

Table 5. Linearity test results

Hypotheses	Parameters	Sum of Squares	df	Mean Square	F	Sig.
H1: Effect of Pedagogical Competence (X_1) on the Ability to Implement Differentiated Learning (Y)	Between Groups (Combined)	1879.250	17	110.544	9.405	.000
	Linearity	1488.423	1	1488.423	126.637	.000
	Deviation from Linearity	390.827	16	24.427	2.078	.051
	Within Groups	282.083	24	11.753		
	Total	2161.333	41			
H2: Effect of Teacher Self-Efficacy (X_2) on the Ability to Implement Differentiated Learning (Y)	Between Groups (Combined)	1784.258	16	111.516	7.393	.000
	Linearity	1433.865	1	1433.865	9.065	.000
	Deviation from Linearity	350.393	15	23.360	1.549	.162
	Within Groups	377.076	25	15.083		
	Total	2161.333	41			

The third statistical prerequisite is the multicollinearity test, which is conducted to determine whether there are significant correlations among the independent variables in the regression model (Ghozali, 2005). A reliable regression model requires the absence of such correlations to ensure that each independent variable uniquely contributes to predicting the dependent variable. The multicollinearity test is conducted by examining tolerance values and Variance Inflation Factors (VIF) in SPSS version 26. Multicollinearity is considered absent when VIF < 10 and tolerance> .10. Meeting these criteria ensures that the independent variables are not highly correlated, thereby allowing for reliable multiple regression analysis.

Based on the multicollinearity test results in Table 6, both the pedagogical competence (X_1) and teacher self-efficacy (X_2) variables have tolerance values of .152 and VIFs of 6.571. Since the tolerance values exceed .10 and the VIF values are less than 10, it can be concluded that the regression model is free of multicollinearity.

Table 6. Multicollinearity test results

Variables	Collinearity Statistics	
	Tolerance	VIF
X_1	.152	6.571
X_2	.152	6.571

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Since all statistical prerequisites were satisfied, a Multiple Linear Regression (MLR) analysis was conducted. This includes a partial test (t-test) (Table 7) and a simultaneous test (F-test) (Table 8) to determine the influence of the independent variables on the dependent variable. The relationships in Table 7 disclose a variety of patterns between the predictors and the differentiated learning implementation process. Pedagogical competence (X_1) is a positive predictor of the dependent variable (B = 1.050, p = .000) in differentiated learning. However, the beta value (β = 1.301) for pedagogical competence exceeds 1.0, and, combined with the negative B value for teacher self-efficacy (X_2, B = -0.670, p = .001), it indicates a suppression effect in the model.

Therefore, although H1 is supported, the narrative for H2 requires revision. H2 is supported at the statistical level (p = .001); however, the relationship is inverse, as indicated by the negative coefficient (B = -.670). This indicates that while teacher self-efficacy is a significant predictor, it is negatively associated with the implementation of differentiated learning when pedagogical competence is held constant in the model. This finding suggests a suppression effect: high self-perceived efficacy—if not balanced by technical-pedagogical mastery—does not lead to optimal implementation of differentiated instruction.

Table 7. T-test results (partial test)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	14.011	6.448		2.173	.036
X_1	1.050	.127	1.301	8.272	.000
X_2	-.670	.194	-.543	-3.452	.001

Based on the simultaneous test (F-test) results in Table 8, a significance value of .000 (p < .05) is obtained, with an F-value of 62.271, which exceeds the F-table threshold. This indicates that pedagogical competence (X_1) and teacher self-efficacy (X_2) simultaneously have a significant effect on the implementation of differentiated learning (Y). Consequently, H3 is supported, indicating that the combination of strong pedagogical skills and high professional confidence significantly predicts a teacher's ability to implement differentiated instruction effectively.

Table 8. F-test (simultaneous test)

Parameters	Sum of Squares	df	Mean Square	F	Sig.
Regression	1645.921	2	822.960	62.271	.000
Residual	515.413	39	13.216		
Total	2161.333	41			

Table 9. Coefficient of determination (r^2)

Statistics	Values
R	.873
R Square	.762
Adjusted R-Square	.749
Std. Error of the Estimate	3.635

To determine the simultaneous contribution of the independent variables to the dependent variable, the coefficient of determination (R^2) was analyzed. As shown in Table 9, the R-Square value of .762 indicates that pedagogical competence and teacher self-efficacy collectively

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account for 76.2% of the variance in the implementation of differentiated learning. The remaining 23.8% is attributed to other factors not addressed in the current research model.

5. Discussion

Cluster 04 Jetis demonstrates numerous interesting and unorthodox insights into the elements of differentiated instruction, as indicated by the partial test t-test results. Pedagogical competence has a large and statistically significant positive effect on the implementation of differentiated learning (B = 1.050, p = .000), according to the regression results. As a result, it is consistent with the positions of Smale-Jacobse et al. (2019) and Fitriani et al. (2025), who state that differentiated instruction largely depends on a teacher's knowledge of instructional techniques and their ability to design and implement them based on student needs and individualized learning profiles. In other words, when a teacher has a more comprehensive pedagogical tool, particularly for designing diagnostic assessments and adapting strategies to meet students' diverse needs, they can implement differentiated learning more effectively.

However, an essential, though somewhat counterintuitive, finding emerged regarding teacher self-efficacy. It revealed a statistically significant negative correlation (B = -.670, p = .001). Typically, the literature (Hammad et al., 2024; Ramli & Yusoff, 2020) reports that higher self-efficacy is associated with greater instructional success. Conversely, the negative coefficient in this particular case implies an "overconfidence gap," or suppression effect, indicating that among the sampled teachers, high levels of self-efficacy did not necessarily equate to better differentiated practices; in fact, an overestimation of one's abilities without a corresponding increase in pedagogical mastery may actually hinder the time-consuming and deliberate process of differentiation. This inverse relationship also elucidates that teachers who are "too confident" in their ability to teach traditionally may be less likely to make the time-consuming, deliberate adjustments required by the differentiated instruction framework, as Haelermans (2022) stated. Additionally, a lack of specificity in a teacher's self-efficacy regarding diversity can detract from their ability to utilize the differentiated instruction framework effectively, as indicated by the negative B value. Furthermore, the findings indicate that while pedagogical competence is the major factor influencing change in these schools, self-efficacy requires a "recalibration" through structured professional development (Satiri et al., 2024) so that teacher confidence does not inhibit, but rather supports, the complex requirements of a diverse classroom.

The multiple regression test yielded an F-value of 62.271 with a significance level of .000 (<.05). This indicates that pedagogical competence and teacher self-efficacy significantly contribute to the implementation of differentiated learning. This finding indicates that the higher a teacher's mastery of pedagogical competence and the stronger their confidence in their professional abilities, the more optimal the implementation of differentiated learning in the classroom.

Specifically, the contribution of pedagogical competence to the implementation of differentiated learning aligns with Tomlinson (2014), who stated that differentiated learning requires teachers to understand students' readiness, interests, and learning profiles through formative and reflective assessment. Teachers with pedagogical competence can design adaptive learning strategies that meet individual student needs. This also aligns with Darling-Hammond et al. (2017), who asserted that teachers' pedagogical knowledge, including the ability to design learning objectives, instructional strategies, and formative assessment, is the foundation of differentiated instruction.

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The research findings confirm previous research by Utari et al. (2025), which found that pedagogical competence significantly influences the implementation of differentiated instruction in elementary schools, particularly in classroom management and diagnostic assessment. Furthermore, Apriyantika and Mustika (2023) emphasized that teachers with high pedagogical competence are more likely to have better skills in managing learning in the implementation of the Independent Curriculum, including strategies for differentiating content, process, and product.

In addition to pedagogical competence, the research findings also indicate a significant relationship between self-efficacy and teachers' ability to implement differentiated learning. This relates to Bandura (1997) theory, which posits that self-efficacy influences a person's thoughts, motivation, emotions, and actions, including professional behavior. Teachers with high self-efficacy tend to be more confident in trying new and creative learning strategies and are persistent in overcoming learning obstacles. This finding is also supported by Tschannen-Moran and Hoy (2001), who stated that a teacher's self-efficacy influences the quality of their instructional interactions with students and their effective classroom management. In differentiated learning, teachers with high self-efficacy are better able to conduct diagnostic assessments, select a variety of learning resources, and provide differentiated instructional support responsive to students' needs (Tomlinson et al., 2003).

Although both variables contribute significantly, the coefficient of determination (R-Squared) is .762, representing a 76.2% contribution; 23.8% of the variance is accounted for by other variables that also influence the implementation of differentiated learning. These factors include support from school leadership, access to professional training, a collaborative teacher culture, and the availability of educational resources (Langelaan et al., 2024). This aligns with Ramnarain's (2016) research, which emphasized that the implementation of the Independent Curriculum is determined not only by internal teacher factors but also by the school system and surrounding structural supports.

6. Conclusion and Implications

Based on the results, a significant simultaneous relationship is found between teachers' pedagogical competence and self-efficacy in implementing differentiated instruction in the elementary schools of Cluster 04 Jetis. The multiple linear regression analysis yields a coefficient of 62.271 ($p < .05$), indicating that both pedagogical competency and self-efficacy are significant predictors in the model. Pedagogical competency and self-efficacy together account for 76.2% of the variance in the implementation of differentiated instruction. Additionally, based on the model's coefficients, pedagogical competency demonstrates a strong positive correlation, while self-efficacy is a significant predictor in this specific cluster context but requires further calibration to accurately reflect the technical requirements of differentiating instruction.

These results provide several operational implications and recommendations for educators. First, since pedagogical competency was identified as a major positive predictor, educators and schools need to commit to providing professional development experiences specifically designed to prepare teachers to use diagnostic assessments to strategically plan for content, process, and product differentiation in their classrooms. Second, to support the nuances of building teacher confidence, educators need to establish coaching and mentoring programs that help transition general teacher efficacy to specific instructional efficacy, thereby grounding teacher confidence in the mastery of various classroom management strategies to meet the needs of students with diverse learning abilities. Lastly, policymakers and school administrators

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should foster a supportive environment by establishing and formalizing Professional Learning Communities (PLCs) across the cluster to enable teachers to share adaptable media and sustainable differentiation strategies. Stakeholders also need to recognize the study's cluster-based focus and allocate resources and provide administrative support to ensure that the movement toward student-centered differentiation is maintained beyond the initial administrative needs.

7. Limitation

This study has some limitations that should be considered when interpreting the results. The first limitation concerns the ex post facto correlational design, which identifies several predictors using a regression model; however, it does not establish causality. A second limitation is the use of self-administered questionnaires, which may introduce social desirability bias. Teachers may report what they believe are ideal classroom practices rather than what they actually do in the classroom. The third limitation concerns the geographic scope of the study. The study was conducted in Cluster 04 Jetis, Bantul; therefore, the generalizability of the findings to other geographic areas may be limited due to differences in socioeconomic status or institutional contexts. From an analytical standpoint, the analysis also indicated a relatively high VIF. Although this falls well below the accepted VIF threshold, it indicates a strong correlation between a teacher's pedagogical competence and self-efficacy, which may affect the reliability of the regression coefficient estimates. This technical limitation illustrates the difficulty of distinguishing a teacher's technical skills from his/her professional confidence.

The limitations of the study may be addressed by conducting future research employing a mixed-methods approach to elucidate the causal mechanisms underlying the statistically significant negative relationship between general self-efficacy and implementation. Recommendations for future research, based on measurable outcomes, include incorporating classroom observations to verify self-reported data against actual differentiated instructional practices and including variables such as leadership support or participation in PLCs into the study. Increasing the study population size and employing longitudinal approaches will enhance the model's robustness and provide additional insight into the factors that sustain adaptive instruction.

Statement of Transfer of Responsibility

The preparer/editor did not received the necessary data or information required to complete and verify the following sections: CRediT authorship contribution statement, declaration of competing interest, data availability statement, ethical approval/ethical declaration, acknowledgements, and AI disclosure statement. Accordingly, full academic and legal responsibility for the content and accuracy of these statements is hereby transferred to the authors, including any consequences arising from non-compliance with the target journal's policies and applicable ethical standards.

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